United States
Department of
Agriculture

Forest Service

Alaska Region
R10-MB-314a

March 1996

Tongass Land Management Plan Revision

Revised Supplement to the Draft Environmental Impact Statement

REVISED SUPPLEMENT TO THE

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TONGASS NATIONAL FOREST

LAND MANAGEMENT PLAN REVISION

ALASKA

Responsible Agency:	USDA Forest Service
Responsible Official:	Phil Janik, Regional Forester USDA Forest Service, Alaska Region
For Further Information:	Beth Pendleton, Co-Team Leader Forest Plan Revision Team 8465 Old Dairy Road Juneau, Alaska 99801 907-586-8700

Abstract: This Revised Supplemental Draft Environmental Impact Statement has been prepared for the revision of the Tongass Land Management Plan. It describes alternatives for managing the resources and uses of the Tongass National Forest, and discloses the potential environmental effects of implementing those alternatives. The revised Tongass Plan will direct all land management activities in the Forest. It will identify what land is to be managed for the different uses, and how the environment will be protected so these uses can be sustained.

Comments regarding this Statement should be sent to the Forest Plan Revision Team office, at the address shown above, by July 19, 1996.

Printed on Recycled Paper

TONGASS LAND MANAGEMENT PLAN REVISION

REVISED SUPPLEMENT TO THE

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Table of Contents

Table of Contents (continued)

Chapter 1
Purpose and Need

Chapter 1

Purpose and Need

Introduction

Forest land and resource management planning is a process for developing, amending, and revising land and resource management plans (forest plans) for each of the National Forests in the National Forest System. Forest plans are required by the National Forest Management Act (NFMA) of 1976. Each forest plan is intended to guide the management of a National Forest for a 10-15 year period, at the end of which a formal revision is required.

The 17-million acre Tongass National Forest, the largest forest in the National Forest System, was also the first to complete a Land and Resource Management Plan under the National Forest Management Act. The original Tongass Forest Plan was approved in 1979, and has been amended twice (in 1986 and 1991). The first revision of this plan is now being considered. The Revised Supplement to the Draft Environmental Impact Statement (hereinafter called the "Revised Supplement") is the third release under the National Environmental Policy Act of a public review draft displaying Forest Plan alternatives and their estimated effects.

A draft environmental impact statement (DEIS) documenting the environmental analysis for this revision was released for public review in June 1990. In November 1990, the Tongass Timber Reform Act (TTRA) was passed. This Act imposed several new requirements for management of the Tongass affecting the Forest Plan and resulted in the preparation of a Supplement to the DEIS, which was released in August 1991. (This Supplement is hereinafter referred to as the "1991 SDEIS.") TTRA made permanent changes to Forest Plan land allocations and standards and guidelines which applied to all alternatives in the Supplement (explained in Chapter 1 of the 1991 SDEIS), and for that reason the 1991 SDEIS replaced the 1990 DEIS.

This Revised Supplement is therefore a supplement to the 1991 SDEIS, rather than to the original (and superseded) DEIS. A Notice of Intent for the Revised Supplement was published in the Federal Register in August 1994. (The release of a final environmental impact statement (FEIS) and decision had been scheduled for early 1993, but was put on hold in order to conduct additional analysis, which ultimately led to this Revised Supplement. A 1992 draft version of this FEIS included alternatives recently used in congressional proposals, and these have therefore become the basis of some Revised Supplement alternatives. See Chapter 2.)

Need for Change

The "purpose and need" for the Tongass Forest Plan Revision, beyond the basic NFMA requirement for periodically revising forest plans, centers on the basic elements of what constitutes a forest plan. These were described in detail in Chapter 1 of the 1991 SDEIS under the "Need for Change." The six forest plan categories considered for changes are: multiple-use goals and objectives, management prescriptions, standards and guidelines, timber suitability, allowable sale quantity, and monitoring and evaluation. The Revised Supplement considers additional changes in all these categories. These are discussed in Chapter 2. For the 1991 SDEIS, requirements of the Tongass Timber Reform Act affecting forest planning became additional needs for change. These are discussed in applicable sections of Chapter 3, especially "Fish," "Roadless Areas," "Timber," and "Wilderness"; and in the Proposed Plan, Chapter 5.

1 Purpose and Need

Public Issues

Ten public issues were originally identified in 1988 for the Forest Plan Revision. These were used for the 1990 DEIS, and remained the same, with some updating, for the 1991 SDEIS. Each issue statement is framed as a question, and these are elaborated on in the 1991 SDEIS. These original issue statements are listed here. (An additional "issue" was mentioned in the 1991 SDEIS, that of identifying and considering for recommendation potential Wild, Scenic, and Recreational Rivers.) The 1991 SDEIS displays in detail how these issues were addressed through alternative development (Chapter 2) at that time, and Chapter 2 here summarizes this information for the alternatives carried over to the Revised Supplement.

Scenic Quality. What areas of the Tongass National Forest should be managed to emphasize scenic resources?

Recreation. What areas should be managed to emphasize recreation opportunities?

Fish Habitat. What methods should be used to protect resident and anadromous fish habitat?

Wildlife Habitat. What amount of old-growth and undeveloped habitat should be managed for the protection of wildlife?

Subsistence. What should the Forest Service do to continue providing subsistence opportunities?

Timber Harvest. What areas of the Tongass should be managed to emphasize timber harvesting?

Roads. What road system should be developed in the Tongass National Forest?

Minerals. What areas and accessibility should be emphasized for exploration, development, and production of mineral resources?

Roadless Areas. What areas and what amount of roadless lands should be recommended for Wilderness Designation or other types of unroaded management?

Local Economy. What ways should National Forest Lands be managed to provide for the local lifestyles of Southeast Alaska communities?

The "New" Issues

The "need for change" portrayed the general purpose and need for doing the Revision. Addressing the ten issues just listed further defined the purpose and need for the 1990 DEIS and 1991 SDEIS. Part of the purpose and need of this Revised Supplement is to further address several issues that have continued to be of concern for the Tongass and which are relevant to National Forest planning.

Since the release of and comment period on the 1991 SDEIS, considerable new information bearing on the Tongass Forest Plan Revision has come to light, including additional scientific reviews and studies, new or updated resource inventories, and comments and reports from interest groups and individuals. Out of this new information emerged five issues determined by the Regional Forester to need more study and evaluation before a final Revised Forest Plan could be adopted. Some of these issues are aspects or extensions of the ten public issues previously considered (fish and wildlife habitat, and the local economy), others are new as issues (caves and karst) or were not considered as issues in themselves (alternatives to clearcutting). Background on these issues is presented here (much of which, especially recent studies and assessments, is discussed in more detail in the relevant resource sections of Chapter 3). The new issues are not framed as questions as was done for issues previously.

Wildlife Viability

The issue concerning wildlife viability centers on questions of whether the current Forest Plan, or the alternatives considered for revising the Forest Plan (in either the 1991 SDEIS or the unpublished 1992 Tongass Forest Plan Revision Final Environmental Impact Statement (FEIS)), provide for sufficient habitat to ensure the maintenance of viable wildlife populations within the Tongass National Forest (as required by 36 CFR 219.19).

Early in 1993, the Alaska Regional Forester postponed a final decision on the Revised Forest Plan and requested the Forest Service's Pacific Northwest Research Station to conduct a scientific peer review of a viability strategy recommended by the Interagency Viable Population Committee, and other planning documents related to viability, as part of the Forest Plan Revision process. Results of this peer review were released in 1994 ("Review of the Wildlife Management and Conservation Biology on the Tongass National Forest: A Synthesis with Recommendations," March 1994). The peer review concluded that a strategy like that recommended by the Committee went further in ensuring habitat to support viable wildlife populations than the Revision alternatives, but that other methods and approaches also need to be considered. It also noted a lack of information about wildlife in Southeast Alaska, and the need for more study.

Also in 1994, the Alaska Region of the U.S. Fish and Wildlife Service (USFWS) accepted two petitions for listing under the Endangered Species Act, for the Queen Charlotte goshawk (as endangered) and the Alexander Archipelago wolf (as threatened), in Southeast Alaska. In June 1994 a reserve strategy for maintaining habitats for viable wildlife populations was used in developing the Fiscal Year 1994-95 timber sale/timber offerings schedule for the Tongass. This was partly based on the recommendations of the Interagency Viable Population Committee, and also used preliminary information from an interagency goshawk meeting. After additional study, this scheduling effort was followed by the release of a draft Environmental Assessment for a proposed Forest Plan amendment to further address short-term habitat concerns related to wildlife viability ("Interim Habitat Management Guidelines for Maintaining Well-Distributed Viable Wildlife Populations within the Tongass National Forest," September, 1994). A second interagency meeting on the goshawk, in October 1994, used new inventory information to refine proposed goshawk habitat management guidelines.

During the first half of 1995, the USFWS announced decisions on the wolf and goshawk petitions. Neither species was found in need of listing at this time, but USFWS stated in both cases that without substantive changes in management of the Tongass, future viability was a definite concern. The Forest Service and four other federal agencies have signed a National Memorandum of Understanding (MOU) for the conservation of species that may be considered for listing under the Act, and an emphasis on species tending toward listing. In addition, a similar MOU with similar purposes pertaining specifically to Alaska has recently been entered into between the Alaska Regions of the Forest Service and USFWS, and the State of Alaska Department of Fish and Game. Early and adequate conservation of candidate species may preclude the need for additional protection and listing. (For a review of Forest Service policy on preservation strategies and preventing the need to list under the ESA, see Capp 1996.)

Fish Habitat

Concurrent with the work and actions taken relative to wildlife viability, in 1994 an Alaska Anadromous Fisheries Habitat Assessment (AFHA) was conducted, at the direction of Congress, for the purposes of studying the effectiveness of current procedures for protecting anadromous fish habitat, and determining if any additional protection was needed. This assessment concluded that current measures, and their implementation, were not fully effective for preventing habitat degradation or protecting salmon and steelhead stocks in the long term. AFHA included recommendations to consider for the Tongass Plan Revision, and additional recommendations were made by the team that conducted the on-the-ground analysis for AFHA.

Karst and Caves

The extent and importance of the cave resources of the Tongass have only recently come to light. The 1991 SDEIS considered caves, and included some recognition of the "karst" geology in which they are typically found, in Forest-wide standards and guidelines, and through a proposed Karst Areas Geological Area. More recent studies and surveys, including a "Karst and Cave Resource Significance Assessment" (Aley et al., 1993) done for the Ketchikan Area, have indicated a more extensive resource of world-class significance, and the need to consider improved standards and guidelines. Several recent timber sale projects in karst areas have identified a similar need.

Alternatives to Clearcutting

Commercial timber harvest in the Tongass National Forest has traditionally relied on one even-aged silvicultural system, clearcutting. This system has proven very successful in Southeast Alaska in several ways: it is relatively economical; it is effective in controlling forest diseases; it eliminates blowdown; and it results in adequate natural regeneration, particularly of less shade-tolerent species such as Sitka spruce. On the other hand, clearcutting continues to be controversial in Southeast Alaska. The principal objections are to the visual changes in the landscape, and potential adverse effects to streams, slope stability, and loss of old-growth forest, particularly as habitat for wildlife. Since the 1991 SDEIS the Forest Service's Ecosystem Management policy has come out, which includes a strong emphasis on limiting the amount of traditional clearcutting, and on using alternative silvicultural systems.

Socio-economic Considerations

The socio-economic environment of Southeast Alaska and its relation to the resources and uses of the Tongass has undergone some significant changes in recent years. Since the 1991 SDEIS, the timber industry has seen the permanent closure of one of two major pulp mills (the Alaska Pulp Corporation mill in Sitka), the development of several new small mill operations, and the termination in 1994 of one of two long-term sale contracts. The need to address habitat for wildlife viability discussed above has led to some reductions in timber sale offerings, and other potential sales have been delayed through legal action.

The timber industry is not the only economic segment undergoing change. For instance, the tourism industry continues to see rapid growth, indicating the need to better reflect tourism needs and concerns through specific management direction and improved inventories. An extensive update of the social and economic settings and concerns of the 30+ Southeast Alaska communities became necessary in order to have the best information on local uses of, and economic ties to, the Tongass, and to better understand what each community itself desires from the Tongass National Forest.

The Revised Supplement

The Revised Supplement is a supplement to the 1991 SDEIS, intended primarily to address the new or expanded issues, discuss the resulting changes in the 1991 alternatives and proposed management direction, and display the analysis of the environmental consequences of these changes. In order to reduce or remove the need for the reader to have both sets of documents, material from the 1991 SDEIS that is currently applicable has been summarized and/or updated throughout, particularly for all resource sections within Chapter 3 (Environment and Effects). Chapter 2 (Alternatives) contains a higher percentage of new material. The 1991 SDEIS is liberally referenced, and still provides the detailed background for most resources and scientific methodologies. The separate Proposed Revised Forest Plan is completely replaced.

Most appendices from the 1991 SDEIS have not been updated, nor reprinted, for the Revised Supplement. All appendices about specific areas (roadless areas, research natural areas, etc.) will be updated for the final environmental impact statement (Appendices C, D, E and F in the 1991 SDEIS). An updated Appendix B (modeling and analysis process) is included. Appendix K (subsistence data) is replaced by a different form of analysis (and included here as Appendix C).

This Revised Supplement, along with the 1991 SDEIS, is tiered to the EIS for the Alaska Regional Guide, which establishes Regional standards and guidelines and distributes targets from the National Resources Planning Act program to the forests. When a final Revised Plan is approved and implemented, the environmental analysis for projects will in turn tier to the FEIS for the Tongass Land Management Plan Revision ("Tiering" is the process under the National Environmental Policy Act of relying on programmatic or "higher-level" environmental analyses for the treatment of general matters and focusing on more specific matters in the subsequent analysis.).

Following public review of the Revised Supplement, public comments will be analyzed and a final Environmental Impact Statement will be prepared. The Regional Forester, in a Record of Decision, will select an alternative from the FEIS as the Tongass Forest Plan. Once adopted, the revised Forest Plan will supersede all current Tongass Forest Plan direction.

Additional information, maps and documents used in the Tongass National Forest Land Management Plan revision process are contained in the planning record. These may be reviewed at the Tongass Plan Revision Team Office, 8505 Old Dairy Rd., Juneau, Alaska, during regular business hours. The planning record in its entirety is incorporated here by reference.

Chapter 2
Alternatives

Chapter 2

Alternatives

Introduction

Chapter 2 is divided into four parts:

- a discussion of how alternatives were developed, and of what constitutes an alternative
- a discussion of alternatives considered but eliminated from detailed study
- a full description of the alternatives that are considered in detail
- a comparison of the alternatives considered in detail.

A large-scale map for each of the nine alternatives considered in detail are included in the map packet accompanying this document. (Alternatives 5 and 6 are combined on one map.) Each map shows the locations of the land use designations for each alternative.

Alternative Development Process

What a Forest Plan Includes

Nine alternatives are considered in detail in the Revised Supplement. Most are based on alternatives from the uncompleted and unpublished 1992 Final Environmental Impact Statement (discussed in Chapter 1), which in turn were derived from alternatives in the 1991 SDEIS. Some of these relationships are important since the Revised Supplement is supplementing the 1991 SDEIS, the most recent published and publically reviewed document, and it relies to some extent on the effects analyses and alternative comparisons from that document. The general relationships - the overall themes and goals of the alternatives - remain fairly consistent between the three documents, as does some of the more specific management direction. In other cases there are important differences between the 1991 SDEIS alternatives, those described and analyzed in 1992, and those in the Revised Supplement. These differences will be explained.

Chapter 2 of the 1991 SDEIS discusses in detail the general process used to develop Forest Plan alternatives, including the different ways that issues can be addressed, the use of the “need for change” (described in Chapter 1), and how the goals of recent Federal programs and initiatives were incorporated. This discussion is still applicable and will not be repeated here, except to summarize a few key points.

Land management planning may be compared to city, county or borough zoning. Just as areas in a community are zoned as commercial (allowing business uses), industrial (allowing factories), or residential (allowing only homes, schools, etc.), the forest is also "zoned" to allow, or not allow, various uses and activities. Land management (forest plan) zoning is done through the use of land use designations.

Land use designations (LUD's) specify ways of managing an area of land and the resources it contains. LUD's may emphasize certain resources (such as Wilderness, or old-growth wildlife habitat), or combinations of resources (such as providing for scenic quality in combination with timber harvesting). Each land use designation has a detailed management *prescription* which includes practices and standards and guidelines.

Practices are specific actions or treatments used in the management of forest resources, such as even-aged timber harvest methods (clearcutting, for instance). Each management prescription specifies which practices are allowed to be considered for site-specific project proposals, and under what conditions. *Standards and guidelines*, on the other hand, impose limitations on how, where, and when management activities are carried out, usually for specific resource protection purposes.

The land use designations are assigned, or "allocated," to specified areas of land. Some LUD's, such as Wilderness, are congressionally designated, but many can be allocated differently depending on the resource issue or issues being addressed. Under any one alternative, a given area of land will normally have only one LUD assigned to it (or, in the case of the Minerals and Transportation and Utility Systems LUD's, only one LUD in use at one time). In some cases, two LUD's may apply to the same area, such as a Wild River within a Wilderness. In these cases, the more restrictive direction always applies.

Forest resource use opportunities (such as timber harvesting or recreation) can be made available in different amounts. How much timber to offer, or how much of a particular kind of recreation "opportunity" to provide, are questions that land management planning must also answer. It is not always possible to provide all the resource use opportunities in necessarily the amounts desired.

Alternatives themselves are usually designed around a "theme" that emphasizes a particular issue (such as the local economy) or a group of compatible issues (such as scenic quality and wildlife habitat). How alternatives were developed to address the Revised Supplement issues is discussed later. The comparison of alternatives section at the end of this chapter also discusses ways in which the alternatives address the issues.

The computer model used for National Forest planning (FORPLAN), and the "benchmarks" originally run to determine forest resource potentials, are discussed in the 1991 SDEIS, along with the overall supply and demand situation for the Tongass. This information is not repeated here. Modeling updates are included in a revised Appendix B (Modeling and Analysis), and supply and demand information is presented by resource in Chapter 3.

How Alternatives are Constructed

Each alternative for the revision of the Tongass Land Management Plan will be presented in the same format. This includes the following components:

- **Theme.** The overall management intent and resource emphasis.
- **Goals.** More specific statements of emphasis, by issue or resource.
- **Objectives and Outputs.** Amounts of resource use opportunities, protected habitats, etc., that will be provided.
- **Land Use Designations.** The acreages allocated to each land use designation.
- **Standards and Guidelines.** Which options for Forest-wide direction to be applied at the project level will be used.

A simple example of how these components work together can be given. Let's assume that part of the theme of an alternative is to emphasize tourism in support of the local economy. Two goals including aspects of this theme might be:

> Emphasize recreation places and opportunities important to the tourism industry.
>
> Emphasize scenic quality along the Alaska Marine Highway, major cruise ship routes, State highways, and frequently-used Forest roads.

Objectives to carry out these goals could include providing sufficient tourism-related recreation places to accommodate a certain amount of user capacity (usually expressed as "recreation visitor days"), and applying the more-protective visual quality objectives ("retention" and "partial retention") to areas seen from the routes mentioned in the second goal. Land use designations that are compatible with the goals - such as remote and semi-remote recreation, scenic viewshed and modified landscape - could be assigned to geographic areas having the desired opportunities or locations. Forest-wide standards and guidelines for recreation and scenery would also be applied at the project level to carry out the goals and objectives.

Land Use Designations

While the allocation (the geographic locations) of most land use designations can vary by alternative, the management prescriptions for each specific LUD do not change (except for certain timber harvest practices in some LUD's, which will be specified by alternative). Chapter 3 of the Proposed Revised Forest Plan includes the full set of proposed management prescriptions for each land use designation. These are summarized below, following a discussion of current Forest Plan LUD's.

The current Tongass Forest Plan uses four basic land use designations (LUD's) and several LUD variations to specify how areas of the Tongass National Forest are to be managed. Each of the four basic LUD's has a stated purpose and related management implications describing how the land should be used. LUD II - Legislated, a variation of the basic LUD II, was added to the Plan because of the Tongass Timber Reform Act. In the 1991 SDEIS, the LUD's of the current Forest Plan were converted to the new set of land use designations described below, primarily to facilitate the effects analysis and comparisons of alternatives. Technical difficulties made this conversion less-than-perfect, however, and we have gone back to the original LUD's for Alternative 9, the "current" alternative in the Revised Supplement. These are defined here using the wording from the most recent Tongass Land Management Plan map (March 1991). The full definitions of the LUD's used in the current Plan are included as Appendix A.

- **Land Use Designation I (Wilderness).** Wilderness Areas will be managed as directed by the 1964 Wilderness Act, as amended by ANILCA, which provides for the following uses: fishing, hunting, trapping, subject to State Fish and Game regulations; subsistence uses; public recreation cabins (existing and limited new); structures and facilities under special use permit and/or public use; fish habitat enhancement; access to private, State, Native lands; use of airplanes, motor boats, and snow machines; beach log salvage, subsistence, and recreation use of timber.

  Lands released from Wilderness recommendation - to be allocated through the land management planning process, and Nonwilderness National Monument Lands - as described in the previous list of land use designations, are considered variations of LUD I in the current Plan.

- **Land Use Designation II**. These lands are to be managed in a roadless state to retain their wildland character, but this would permit wildlife and fish habitat improvement and primitive recreational facility development. This designation will exclude: (1) Roads, except for specifically authorized uses; (2) Timber harvesting, except for controlling insect infestations or to protect other resource values; (3) Major concentrated recreational facilities. LUD II - Legislated is a variation of this basic LUD, to be managed in perpetuity as LUD II.

- **Land Use Designation III**. These lands will be managed for a variety of uses. The emphasis is on managing for uses and activities in a compatible and complimentary manner to provide the greatest combination of benefits. These areas have either high use or high amenity values in conjunction with high commodity values. Allowances in calculated potential timber yield have been made to meet multiple-use objectives. These lands may include concentrated recreational developments.

  [A "LUD III Special" category is also included, with the purpose of minimizing effects on visual and recreation resources in areas directly adjacent to communities. Timber harvest is designed to be compatible with local recreation and visual resource uses, and does not count towards the Forest Plan's allowable sale quantity.]

- **Land Use Designation IV**. Opportunities will be provided for intensive resource use and development where emphasis is primarily on commodity or market resources. Allowances in calculated potential timber yield have been made to provide for protection of physical and biological productivity.

The 1991 SDEIS includes 23 different land use designations developed for the Tongass Forest Plan Revision. These LUD's represent a wide range of allocation choices for managing specific areas of the Forest, from wilderness (essentially no land-disturbing activities) to full commodity development (intensive timber harvesting or mining). For the Revised Supplement, two of these LUD's have been dropped, and two have been changed to Forest-wide standards and guidelines. The "Other Areas" LUD served no real purpose, simply representing areas left over after the allocation process. "Fish Habitat and Water Quality Requirements" was a slightly less protective version of one of two riparian area LUD's, and was only used for one alternative. It has been dropped, and the other riparian area LUD, "Stream and Lake Protection," is now one of three options under the Riparian Forest-wide standards and guidelines. Similarly, the "Beach Fringe and Estuary" LUD is now a Forest-wide standard and guideline. Among the 19 remaining LUD's, only the Old-growth Forest LUD has changed significantly since the 1991 SDEIS.

Following are brief descriptions of the 19 land use designations considered for Alternatives 1-8. Two name changes have occurred: Primitive Recreation is now called Remote Recreation, and Semi-primitive Recreation is now Semi-remote Recreation.

- **Wilderness** - Manage for the protection and perpetuation of essentially natural biophysical and ecological conditions and provide outstanding opportunities for solitude, primitive recreation, and scientific and educational uses, consistent with ANILCA and the Wilderness Act. Roads are normally not permitted and use of mechanical transport and motorized equipment is limited.

- **Wilderness National Monument -** Manage the Wilderness portions of Admiralty Island and Misty Fiords National Monuments to provide outstanding opportunities for solitude and primitive recreation and to protect objects of ecological, cultural, geological, historical, prehistorical, and scientific interest, consistent with ANILCA and the Wilderness Act. Roads are not normally permitted and use of mechanical transport and motorized equipment is limited.

- **Non-wilderness National Monument** - Manage the nonwilderness portions of Admiralty Island and Misty Fiords National Monuments to facilitate development of significant mineral resources, and to ensure that mining activities are compatible, to the maximum extent feasible, with the purposes for which the Monument was established.

- **Research Natural Area** - Manage forest resources for research and education and/or to maintain natural diversity. Current natural conditions are maintained insofar as possible. No timber harvest is allowed.

- **Remote Recreation -** Provide recreation opportunities and experiences outside Wilderness in unmodified natural environments where interaction with other visitors is infrequent, and the opportunity for independence and self-reliance is high. Timber harvesting is limited to insect and disease control. Roads are generally absent.

- **Enacted Municipal Watershed -** Manage enacted municipal watersheds to meet State Water Quality Standards for domestic use. Timber harvest is limited to insect and disease control; however, timber may be removed under conditions which safeguard the quantity and quality of water. Roads are generally limited to those needed to administer the municipal watersheds.

- **Old-Growth Habitat** - Maintain a diversity of old-growth conifer habitats in their natural condition to favor old-growth associated fish and wildlife species. No timber harvesting will be scheduled and roads will be located outside the area when possible.

- **Semi-remote Recreation** - Provide motorized and non-motorized recreation opportunities in natural and natural-appearing environments where interaction with others is low and the opportunity for independence and self-reliance is moderate to high. Allow occasional concentrated recreation and tourism facilities in a natural-appearing setting. When present, roads are few and used primarily to expand and improve access to recreation opportunities or to permit access to other parts of the Forest and other ownerships. Timber harvest is limited to salvage of catastrophic events or beach log recovery.

- **LUD II -** Manage these Congressionally designated areas in a roadless state to retain the wildland character. Wildlife and fish habitat improvement and primitive recreational facility development may be permitted. Timber harvesting is limited to insect and disease control. Roads will not be built except to serve mining and other authorized activities and vital Forest transportation system linkages (These areas are sometimes referred to as "Legislated LUD II.").

- **Experimental Forest** - Manage to provide a variety of long-term opportunities for Forest research and demonstration areas. Timber harvesting will occur only for these purposes. Roads may be developed to facilitate ongoing research.

- **Scenic Viewshed** - Management activities are not visually apparent to the casual observer in the near distance from visual priority travel routes and use areas. In the middle to background distance, activities are subordinate to the landscape character of the area. Timber harvest is allowed and roads are permitted.

- **Modified Landscape** - Manage for a variety of uses. Management activities are subordinate to scenic quality as seen in the near distance. In the middle to background distance, activities may dominate but are designed to be compatible with features found in the characteristic landscape. Timber harvest is allowed and roads are permitted.

- **Timber Production** - Manage the area to maintain and promote industrial wood production. These lands will be managed to advance conditions favorable for the timber resource and for long-term timber production. Roads are permitted.

- **Minerals** - Encourage the exploration and development of mineral resources in areas having high potential for mineral commodities including nationally-designated strategic and critical minerals. Until mineral activities are initiated, the area will be managed according to the underlying land use designation.

- **Special Interest Area** - Provide for the inventory, maintenance, protection, and interpretation of areas with unique archeological, historical, recreational, scenic, geological, botanical, zoological or paleontological features. No timber harvest is scheduled. Roads are normally not permitted unless compatible with interpretive objectives.

- **Wild River** - Maintain and enhance the outstandingly remarkable values of river segments which qualify the river to be classified a Wild River. Shorelines are primitive and undeveloped. Timber harvesting is limited to insect and disease control. Roads are generally not present. Access is by trail, airplane or boat.

- **Scenic River** - Maintain and enhance the outstandingly remarkable values of river segments which qualify the river to be classified a Scenic River. Shorelines are largely undeveloped but may be accessible in places by roads. Timber harvesting is limited by the ability of the landscape to visually absorb the activity. Roads are designed to be compatible with the landscape.

- **Recreational River** - Maintain and enhance the outstandingly remarkable values of river segments which qualify the river to be classified a Recreational River. Shoreline development may occur and the river may be readily accessible by road. Timber harvesting is allowed with priority to maintain existing and proposed recreation sites within the corridor. Roads are permitted.

- **Transportation and Utility Systems** - Emphasize existing and potential state-identified major public transportation and utility systems. Until transportation or utility systems are constructed, the area will be managed according to the underlying land use designation.

Considerations Used for the Revised Supplement Alternatives

Before discussing how the Revised Supplement issues are addressed through the alternatives, it should be pointed out that the original ten issues are not being revisited at this time because they have been adequately addressed in the 1991 SDEIS. The issues were also addressed through alternatives contained in the previously mentioned unpublished 1992 FEIS (see Chapter 1), particularly in Alternative P, which was the preferred alternative at that time. The new alternatives presented in this Revised Supplement are based on several of the unpublished FEIS alternatives (see Table 2-1). The original issues continue to be addressed in the effects analysis for the new alternatives in Chapter 3. The "Comparison of Alternatives" section at the end of this chapter portrays how "old" as well as new issues have been considered.

Chapter 1 discussed the five new - or expanded - issues that are the focus of the alternatives in the Revised Supplement. Information about these issues, including the results of recent science asessments, resource reports, and public comments, has been combined with the information used to develop the unpublished 1992 FEIS alternatives to create nine alternatives for detailed consideration in the Revised Supplement. Several recent legislative proposals have included specific mention of the Tongass National Forest, including direction for implementing Alternative P from the unpublished 1992 FEIS. In October 1995, preliminary thinking about alternatives was presented at a series of public meetings throughout Southeast Alaska, and feedback and comments from these meetings helped further shape the alternatives.

Discussed briefly here are some of the principal ways in which the five Revised Supplement issues are addressed through alternatives.

Wildlife Viability. Wildlife conservation strategies addressing individual species viability and ecosystem diversity have generally employed one or both of two key features: protected habitat reserves, and modifications of practices within timber harvest areas (see Wilcove et al. 1986). Habitat reserves have tended to be the focal point of conservation strategies since the pioneering work of MacCarther and Wilson (1967) on the theory of island biogeography: that the equilibrium number of species on an island generally depends on island size, and island distance from (usually mainland) source populations. Reserves are viewed as islands of undisturbed or natural habitat within an "ocean" or landscape of management-altered or dissimilar habitat. Reserves attempt to protect and perpetuate the biodiversity of an isolated landscape. In the other approach, harvest areas (conventionally called the "matrix") are managed as landscapes within which particular vegetative or habitat characteristics are to be provided, often using extended timber rotations or silvicultural prescriptions patterned after natural ecological processes or events.

A reserve-based strategy relies on blocks of intact, largely undisturbed habitats (such as old-growth forest) of the appropriate size, spacing, and composition to meet a desired design that will ensure the maintenance of viable, well-distributed populations of one or more species. The habitat conservation area (HCA) network used for the conservation of spotted owl habitat in the Pacific Northwest is a classic example (Thomas et al. 1990). The interagency Viable Population Committee developed a similar strategy for maintaining habitat for viable wildlife populations across the Tongass (Suring et al. 1993). Influenced by the spotted owl strategy, this Tongass strategy includes a system of large and medium HCA's, small HCA's within each 10,000-acre watershed, and coastal beach fringe and riparian buffers for landscape connectivity. The reserve strategy discussed below and applied to some Revised Supplement alternatives is based on the Viable Population Committee's work. Other landscape management approaches developed in recent years are discussed in Verner et al. 1992, and Andersen and Mahato 1995.

An alternative wildlife conservation approach is to recognize the dynamic nature of ecosystems, in particular the related natural disturbance regimes, and manage an entire area (the matrix) to achieve a desired mixture of vegetation cover types and seral (age class) stand structures. Under this strategy, optimal percentages of such factors are determined based on individual species needs, and the landscape is managed for a spatially dynamic, but proportionately stable, composition of habitat types, including young growth. The approach used for the northern goshawk in the southwestern United States is an example (Reynolds et al. 1991).

Implicit in this matrix management approach is the use of extended silvicultural rotations (the time period between two harvests of the same unit) to achieve the desired distribution and abundance of seral stage classes (Henderson 1993). Uneven-aged management systems may also be selected over even-aged systems. Such practices are particularly necessary to perpetuate the structures and processes of old-growth forests (Weigand et al. 1994).

Potential drawbacks of a reserve approach are the failure to consider natural disturbance processes-the dynamic nature of ecosystems, and not being able to preserve landscape integrity (Irwin and Wigley 1992). These can be overcome by combining a reserve system with some type of matrix management approach (Thomas et al. 1990, Franklin 1993). As a complement to reserves, matrix management can serve at least three important roles: 1) providing habitat at smaller spatial scales, 2) increasing the effectiveness of the reserves, and 3) improving landscape connectivity.

Information from several species assessments, an old-growth forest inventory, and other recent wildlife surveys and studies was evaluated and synthesized to help identify conceptual approaches in which adequate wildlife habitats capable of supporting viable wildlife populations could be provided. Four general strategies (each of which could include a variety of options or component parts) were identified:

1. A system of large, medium, and small old-growth forest reserves (or "habitat conservation areas") distributed across the forest, in which most management activities are restricted. Habitat corridors connecting reserves may be provided through expanded beach fringe corridors and riparian areas.

2. Modifications to silvicultural harvest practices throughout the area of planned timber harvesting so that old-growth habitat characteristics, if not true old growth, are perpetuated or extensively achieved. All the methods discussed below under "Alternatives to Clearcutting" can be used.

3. A combination of the first two strategies could be used, such as using reserves in areas which have a history of extensive timber harvesting, and employing alternative silvicultural practices elsewhere.

4. Relying on existing withdrawn areas (such as Wilderness), areas to be managed for purposes other than timber harvesting, and other ways in which old-growth forest would be maintained (such as within riparian areas). This approach does not necessarily identify areas for protection based on specific wildlife habitat values, or their location and distribution across the Forest.

Fish Habitat. Three options for streamside (riparian) habitat management are available, all in the form of Riparian Forest-wide standards and guidelines. Option 3 is similar to the Stream and Lake Protection LUD used in the 1991 SDEIS for most alternatives (and also used, but called Riparian Area, in the unpublished 1992 FEIS for Alternatives P and D++). Option 2 basically represents the protection called for in the Anadromous Fish Habitat Assessment (AFHA - discussed in Chapter 1, and under "Fish" in Chapter 3). Option 2 provides greater protection than Option 3, which does not include all measures recommended by AFHA to provide long-term protection. Option 1 is the most protective, incorporating additional measures over Option 2 to reduce the risk to fish habitat.

Karst and Caves. Three options for karst and cave resources protection are available. The 1992 FEIS included Forest-wide standards and guidelines (Minerals, Geology, and Caves) for caves which included some recognition of karst features but not of karst as an ecosystem or unique system. The Karst and Cave Resources Assessment (1995) has used considerable new information, much of it from field studies, than was available in 1992, and has proposed in-depth, detailed Forest-wide standards and guidelines for Karst and Cave Resources. A third option would be to apply cave protection measures only to the extent needed to comply with the Federal Cave Resources Protection Act, which provides for the identification and protection of significant caves.

Alternatives to Clearcutting. Many alternative silvicultural systems to standard clearcutting exist, but their applicability to the forests and terrain of Southeast Alaska is largely unknown. Studies are lacking on the effects and implementability of these methods. Systems that come close to matching natural disturbance processes are more likely to be successful from a silvicultural as well as ecological standpoint. Two alternatives to, and one variation of, clearcutting as traditionally planned and practiced in the Tongass are being considered: uneven-aged management, which can be the harvest of individual trees or small groups of trees; a system called "two-aged" management, which leaves roughly 10-20 percent of the trees within a harvest unit uncut (and in various aggregations); and clearcutting where planned future harvests occur at longer time intervals than the minimum allowed by regulation (a variation of, rather than alternative to, clearcutting). The time intervals of this latter approach are called "rotation ages," signifying the age of a stand at the time it is harvested again. These can be extended from the current anticipated average rotation of about 100 years to rotations of 200 years or greater.

Socio-economic Considerations. Alternative P from the unpublished 1992 FEIS emphasizes several economically-important resources: recreation and tourism, minerals, subsistence, and timber. Providing a supply of timber sufficient to meet market demands is a goal. Alternative 2 in this Revised Supplement carries forward Alternative P essentially unchanged, and Alternatives 3-6 use Alternative P as a starting point. Another alternative considered in the unpublished 1992 FEIS and labeled there Alternative D++ was developed to offer the maximum opportunity for supplying timber. It would provide an annual timber supply well above Alternative P (in the 1992 FEIS D++ had an annual average allowable sale quantity of 520 million board feet). It was not considered in detail in the 1992 FEIS since it did not appear to address other economic sectors or local issues well. Alternative 7 carries forward Alternative D++, now considered in detail, and Alternative 8 uses it as a starting point. Alternative 9, the “No Action” alternative, is the current Forest Plan, which has an annual average allowable sale quantity of 450 million board feet. Recreation, tourism, and subsistence are emphasized variously in Alternatives 1-6, as are both commercial and sport fishing and hunting, through greater protection for important habitat elements; the timber emphasis of Alternative 7 is modified by these same concerns in Alternative 8.

Alternatives Eliminated from Detailed Study

The 1991 SDEIS discussed the rationale for not considering an alternative that would recommend declassifying Wilderness. That reasoning is still valid. The unpublished 1992 FEIS also discussed two alternatives proposed at that time by the State of Alaska, and developed in joint meetings with them, which were considered but eliminated from detailed study. As just discussed, one of these, Alternative D++, is now being considered in detail (as Alternative 7). The other alternative was actually several versions of an alternative that attempted to provide greater wildlife habitat protection while reducing timber harvest (from Alternatives D or D++) as little as possible. These attempts were generally unsuccessful, and none of these versions were considered in detail. Alternative 8 adds a reserve strategy to Alternative 7. Thus the rationale for the "State" alternatives presented in the 1992 FEIS is no longer applicable.

The previous discussion of the Revised Supplement issues indicated several options or approaches possible for addressing each one. Literally hundreds of slightly different alternatives could be developed using all the possible combinations of these various options. By focusing on broad alternative themes, many incompatible combinations can be eliminated, but this may still leave dozens of reasonable combinations. It is also the case that the same goal may be achieved in different ways: for instance, greater riparian area protection may be achieved by using a stricter riparian option, or by using an alternative silvicultural system such as uneven-aged management. The interdisciplinary team did not try out each of these combinations, but sought a broad array of alternatives addressing the five issues in measurably different ways.

This resulted in much "fine-tuning," primarily through discussions, of several of the nine alternatives considered here in detail, but few overall distinctions that represented substantially different alternatives. One "option" that was eliminated from detailed study was the use of timber stand rotation ages averaging more than 200 years. These appeared to create such uneconomic logging conditions that any level of timber program would likely be infeasible. Other than that, there were no alternatives eliminated from detailed study that were not simply variations of the nine considered below. Southeast Alaska Conservation Council and The Sierra Club Legal Defense submitted information for additional alternatives to include in the Revised Supplement. This information was submitted too late to be considered at this time.

The Interagency Viable Population Committee's strategy, and the peer review of that strategy, are discussed under the "wildlife viability" issue in Chapter 1. Following the peer review, the Committee responded by recommending a number of additions to their original proposal. This information was considered and used in developing the Revised Supplement alternatives, but an alternative adopting the full set of the Committee's recommendations was not considered in detail. Of the numerous ways to combine the several alternative options that address wildlife viability, other combinations than the Committee's were felt to provide a reasonable range while also responding to other issues. Preliminary analysis indicates that an alternative matching the Committee's recommendations would be almost identical in outputs to Alternative 5.

Alternatives Considered in Detail

Before presenting the alternatives themselves, this section will define terminology and present information on several aspects of the alternatives,.

Non-declining Even Flow

The Forest Service follows a policy of "non-declining even flow" for timber harvest to ensure that a long-term sustained yield of timber will be available. This means that the amount of timber harvested in any one decade can not exceed that of any succeeding decade. Non-declining even flow is determined in cubic feet of timber volume, which is the measure used for long-term modeling purposes. The timber outputs for each alternative are shown in board feet, which is currently the more common measure, and in cubic feet. The ratio of board feet to cubic feet changes from decade to decade, depending on the timber volume and size of timber harvested per acre, and because timber yield tables based on board feet and cubic feet are constructed independently (cubic feet being a better overall measure of usable wood). Therefore, the board foot volume can vary, even decline, by decade while timber harvest measured in cubic feet remains constant.

Falldown

"Falldown" as used here refers to the difference, usually a reduction, between the number of acres planned for timber harvest and those actually harvested. The Tongass National Forest has commonly experienced falldown in timber sale planning in recent years. Two kinds of falldown have been identified. "Hard" falldown, a reduction in the land base considered suitable for timber harvesting, occurs when unmapped features that would make lands unsuitable (such as high hazard soils or streams requiring buffers) are identified during the planning process, or when the original suitability mapping is found to be in error. "Soft" falldown, a reduction due to project planning, design, or layout, can result from a project-level emphasis on resource issues such as scenic quality, wildlife habitat, or unique features (cave or karst resources, for example), from logging infeasibilities, unfavorable timber market conditions, or from data errors. The primary cause of soft falldown is an incomplete review of site conditions prior to designing or implementing a project. A review of five recent projects showed falldown ranging from 4.5 percent to almost 21 percent (Timber "Falldown" During Implementation, August 1995).

The Revised Supplement is addressing many of the factors that have resulted in falldown at the project level, in particular those resulting from "emerging" issues such as wildlife viability and cave and karst features. More clearly defined standards and guidelines, and more precise mapping of objectives such as for scenic quality, will mean better information for project-level planning. Timber land suitability criteria have also been reexamined, and the mapping of suitable acres improved. High hazard soils will be more consistently defined. Falldown associated with these factors is likely to be substantially less in the future. Other falldown factors, such as unmapped streams requiring Tongass Timber Reform Act buffers, small inclusions of unsuitable soils within soil mapping units, and new resource issues, are likely always to occur. Therefore, the allowable sale quantities of the alternatives include an adjustment for future falldown (discussed in the Timber section of Chapter 3 under “Factors Affecting the ASQ”).

The Allowable Sale Quantity

The amount of timber that could be sold under a Forest Plan alternative is expressed as an "allowable sale quantity" (ASQ). This concept is often misunderstood. The allowable sale quantity is the maximum amount of timber that may be sold from the area of suitable land covered by the Forest Plan within a given decade (although it is usually expressed in average annual terms). It is neither a targeted amount, nor is it a required amount (except as a ceiling). The amount of timber offered for sale by year can exceed the annual average as long as the total decade ASQ is not exceeded; it can also be anywhere below the annual average, and the amount offered for sale over a decade can be below the decadal ASQ. Many factors can result in timber sale offerings that are below the average annual ASQ, including lack of funding, new resource issues that need to be addressed, changes in timber markets, sales held up by appeals or lawsuits, or any of the falldown factors previously discussed.

Allowable sale quantities and other timber harvest figures pertaining to the Tongass have traditionally been expressed in an amount known as "net sawlog," which means sawlog volume only. Another way to express these amounts is in "sawlog plus utility" volume. Utility logs are those with less than one-third usable sawlog volume but at least one-half usable wood chip volume. (Net sawlog includes logs used all or part for chips other than these "utility" logs.) Sawlog plus utility amounts are roughly 15-17 percent higher than sawlog by itself. Both these amounts have been expressed in the common measure known as "board feet." National policy is to replace the board foot measure - which seldom accounts for all the usable wood volume of a log - with a cubic foot measure - which is a more accurate representation of the amount of usable wood fiber.

To ease the transition in moving from a board foot to a cubic foot measure, the Alaska Region and the Tongass will begin expressing timber harvest and sale amounts as sawlog plus utility board foot measure. Thus the standard expression for the ASQ in the future, until only a cubic foot measure is used, will be as sawlog plus utility, and will be a greater amount than if expressed only as sawlog. In comparing current and future timber harvest and sale amounts with past amounts, this will need to be kept in mind. If not otherwise indicated, timber volumes in the text may still be expressed in the net sawlog amount.

Non-interchangeable Components

Economics is an important consideration in determining what lands can be harvested; however, experience has shown that it is seldom feasible to effectively factor in economics as part of the overall timber suitability determination. Economic conditions can fluctuate greatly during the course of a plan period, and even from year to year specific timber species can shift from being economic to uneconomic to harvest. This makes it difficult to assess the economics of harvesting a paricular site even over a 10-year period. Also, the value of the timber sale program must be considered as a whole, rather than by only evaluating individual timber sales or harvest units in isolation, since some sales or units of low value are offset by other higher-value sales or units.

Economic considerations can be adequately addressed using the concept of non-interchangeable components. Non-interchangeable components (NIC's) allow for separating the ASQ into discrete, individually accountable categories. Chargeable timber volume from one NIC cannot be substituted for the achievement of the volume limit of another NIC, nor can the limits on the sale of chargeable timber volume associated with each non-interchangeable component be exceeded. For the Revised Supplement, all alternatives have an allowable sale quantity for the first decade made up of two non-interchangeable components:

NIC I. Normal operable volume scheduled from suitable lands that are available for harvest using existing logging systems (e.g. high-lead, single-span skyline, and shovel). This is the best (most economic) operable ground and is typically where the Forest has been offering sales since 1980.

NIC II. Non-standard operable volume scheduled from suitable lands that are available for harvest using advanced logging systems not in common use (e.g. helicopter, balloon, and multi-span skyline). These lands are presently considered economically and technologically marginal. This volume component has rarely been economic in the past, and usually only attained by additional investment (i.e., pre-roading and advanced logging technology).

1992 Alternative Allocations

The two alternatives from the unpublished 1992 FEIS that form the basis of the majority of the Revised Supplement alternatives were in turn based on 1991 SDEIS alternatives (Alternative P on Alternative P, Alternative D++ on Alternative D). Changes in land allocations between the 1991 and 1992 versions were made for both: for Alternative P, to better address concerns about specific areas as reflected in the public comments on the 1991 SDEIS; and for Alternative D++, to provide the maximum opportunity for intensive timber management. Alternative 2 is based closely on the 1992 version of Alternative P, and Alternative 7 closely resembles 1992 Alternative D++. The changes occurring since the 1991 SDEIS are now discussed.

1992 Alternative P. Changes from "development" to "non-development" LUD's (usually to Semi-primitive Recreation - now Semi-remote Recreation) were made for Mansfield Peninsula, the interior portions of Port Snettisham and the Whiting River area, Farragut Bay, the Chilkat Range and upper Chilkat Peninsula, Kah Sheets Bay, the Sarkar Lakes area, Naha Bay, and most of Dall Island. The Semi-primitive Recreation LUD replaced the Primitive Recreation or Old-growth Habitat LUD's to the north of Bradfield Canal, between Bradfield Canal and Revilla Island, and at Kegan Lake. Scenic Viewshed replaced Modified Landscape in several areas adjacent to the Alaska Marine Highway or cruiseship routes.

Several interior areas previously assigned to Scenic Viewshed or Modified Landscape were changed to Timber Production where scenic values were not an emphasis. Included were areas on Chichagof Island, portions of Port Houghton and the lower Chilkat Peninsula, areas north of Sitka and on north Kruzof Island, portions of north Etolin Island, and a few areas on Prince of Wales and Revilla Islands. Minerals LUD boundaries were changed to exclude it from Wilderness or LUD II.

1992 Alternative D++. Alternative D in the 1991 SDEIS, while it emphasized intensive timber management elsewhere, allocated most lands adjacent to or near local communities to either reduced-timber LUD's (Scenic Viewshed or Modified Landscape) or to Semi-primitive Recreation. Alternative D++ changed most of these allocations to Timber Production, with some areas in the north part of the Tongass remaining in or changing to Modified Landscape. At the same time Alternative D++ used the more-protective Stream and Lake Protection (Riparian Area in the 1992 FEIS) LUD. These changes have been retained for Alternative 7. Three other elements, however, remain as they originally were in Alternative D (Minerals LUD allocations; the Wild, Scenic, and Recreational River LUD allocations; and no Beach Fringe and Estuary requirement).

Standards and Guidelines; Mitigation

With the exceptions noted below, the Forest-wide standards and guidelines included in Chapter 4 of the Proposed Revised Forest Plan apply to all alternatives, and are not repeated here. The proposed Forest-wide standards and guidelines for the Forest Plan Revision have gone through numerous versions since originally being developed in 1989. For most resources, most of the changes that have occurred between the 1991 SDEIS, the 1992 FEIS, and the present set are not significant, representing improved wording, streamlining to avoid redundancy with higher-level direction, incorporation of Forest Service policy changes, etc. Significant changes and options related to the five focus issues are discussed below. Also for most resources, the Forest-wide standards and guidelines parallel or build on other current planning direction, such as the Alaska Regional Guide, and Alaska Region supplements to Forest Service manual and handbook direction (such as the Soil and Water Conservation Handbook), therefore representing the current Forest Plan as well as the other alternatives. This common direction is not discussed further here.

Since they serve as the basic mitigation measures for individual projects under the revised Forest Plan, the applicable land use designation management prescriptions and Forest-wide standards and guidelines are discussed throughout the environmental consequences sections of Chapter 3. The Forest-wide standards and guidelines, and the practices and standards and guidelines of each LUD management prescription. are the full set of mitigation measures for each alternative.

Alternative Component Options

Table 2-1 shows how the various issue-related components described earlier in this chapter (see also table footnotes) have been assigned to the nine alternatives. (Allocations of all the land use designations are displayed later for each alternative.) The options for silvicultural systems, riparian habitat, beach fringe and estuary, and deer winter range are all included in the Forest-wide standards and guidelines in the Proposed Revised Forest Plan (except for the current Forest Plan riparian standards and guidelines, which follow the Tongass Timber Reform Act and Best Management Practices only). The reserve option is a part of the Old-growth Forest LUD. The timber stand rotation lengths, and the use of harvest thresholds and percentages of old-growth habitat retained by value comparison unit (VCU - somewhat analogous to a watershed), are not otherwise specified except in the table and alternative descriptions. (Retention for the current Forest Plan is described in the 1986 Tongass Land Management Plan Amendment.)

The Proposed Revised Forest Plan includes only the newly proposed Forest-wide standards and guidelines for Karst and Cave Resources (K/C S/G in the table). The previous proposed standards and guidelines for caves are included within the Minerals, Geology, and Caves Forest-wide standards and guidelines of the 1991 and 1992 Proposed Revised Forest Plan. The 1992 version used here (92 S/G) is slightly expanded from, but comparable to, the version published as part of the 1991 SDEIS. Under Alternative 9, only significant caves as determined under the Cave Resources Protection Act would be protected.

Table 2-1
Alternative Component Options

Component	Alternative 1	2	3	4	5	6	7	8	9
Alternative Base	1992 A	1992 P	1992 P	1992 P	1992 P	1992 P	1992 D++	1992 D++	Current Plan (No Action) [2]
Reserve Strategy [1]	None	None	All	None	4 Prov.	4 Prov.	None	All	None
Aver. Timber Stand Rotation (Years)	200	100	100	200	200	100	100	100	100
Silvicultural System	UM	ES	2A	UM, 2A	UM, 2A	UM, 2A	ES	2A	ES
VCU Harvest Thresholds (%)	None	None	None	25%/50 yr	25%/50 yr	50%/50 yr	None	None	None
OG Retention/VCU	None	None	None	33%	33%	33%	None	None	Retention
Riparian Habitat:									
FHIP 1 Watershed	Opt 2	Opt 3	Opt 1	Opt 2	Opt 2	Opt 2	Opt 3	Opt 2	TTRA/BMP
All others	Opt 3	Opt 3	Opt 2	Opt 3	Opt 3	Opt 3	Opt 3	Opt 3	TTRA/BMP
Beach1 (0-500')	S/G	S/G	S/G	S/G	S/G	S/G	None	S/G	None
Beach2 (500-1000')	S/G, UM	None	S/G, UM	S/G, UM	S/G, UM	S/G, UM	None	S/G, UM	None
Estuary (0-1000')	S/G	S/G	S/G	S/G	S/G	S/G	None	S/G	None
Karst/Caves	K/C S/G	92 S/G	K/C S/G	K/C S/G	K/C S/G	K/C S/G	92 S/G	92 S/G	Cave Act
Deer Winter Range	Yes	No	Yes	Yes	Yes	Yes	No	No	No

(1) This component refers to the use of a system of old-growth habitat reserves to address wildlife viability. Such a system is in addition to reserves that may already exist, such as within Wilderness or Legislated LUD II areas.

(2) Implementation of projects under the Current Plan typically goes beyond current direction in providing protection for riparian areas and karst and cave areas; the retention method provides selected recognition of deer winter range and beach fringe, and eagle nest buffers also provide beach finge protection. This table, however, is designed to represent only what is actually direction under the Current Plan.

Definitions

Reserves:

All = Large, Medium, and Small reserves proposed by the Interagency Viable Population Committee (Suring et al. 1993).

4 Provinces = N. POW, Kupreanof/Mitkof, Dall Isl., NE Chichagof, + individual reserves (Myers Chuck, Lake Eva, Wright Lake).

Silvicultural System:

UM = Unevenaged Management (single tree/group selection).

ES = Evenaged Short Rotation (approximately 80-150 years, depending upon site potential).

2A = Two-aged stand management (permanent retention of 10-20% of trees during harvest).

Riparian:*

Option 1 (Lowest Risk) - expanded riparian corridors on Class I-III streams, exclusion of high hazard soils, etc.

Option 2 (Lower Risk) - expanded riparian corridors on Class I-III streams (but less so than Option 1), etc.

Option 3 (Higher Risk) - 1991 SDEIS "Stream and Lake Protection" LUD.

TTRA/BMP (Highest Risk) - Tongass Timber Reform Act/Best Management Practices.

FHIP = Forest Habitat Integrity Project: FHIP 1 - highest quality watersheds for sport/commercial fish.

Deer Winter Range: Application of management standards to maintain important deer winter range.

Karst/Caves: K/C S/G - Lower risk standards and guidelines; 92 S/G - Moderate risk standards and guidelines; Cave Act - Protect only identified caves.*

*The levels of risk indicated are relative terms only. They do not imply absolute risk levels.

The Nine Alternatives

Each alternative description includes a theme, multiple-use goals, narrative objectives, a set of land use designations (a table with the acreages allocated to each LUD, and a map - included in the map packet - showing their locations), and other objectives and outputs displayed numerically. The prescriptions (practices, LUD- specific standards and guidelines) of each land use designation are included in the Proposed Revised Forest Plan, as are the Forest-wide standards and guidelines applying to all alternatives, and the options within them. These are also integral parts of the alternatives. Details on the modeling of each alternative for FORPLAN analysis are included in Appendix B. The Regional Economy section of Chapter 3 also includes a map for each alternative displaying the suitable timber lands that could be scheduled for timber harvest.

Several of the multiple-use goals are the same for all alternatives, and are listed here. Current Forest Plan goals for these resources are similar. The Tongass Timber Reform Act (Section 101) direction for the Tongass to "seek to provide a supply of timber ... which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle" will be followed by each alternative "to the extent consistent with providing for the multiple use and sustained yield of all renewable forest resources," as determined by that alternative, and subject to appropriations and applicable law.

Goals Common to All Alternatives

Air. Maintain the current air resource condition to protect the Forest's ecosystems from on- and off-Forest air emission sources.

Research. Continue to seek out and promote research opportunities that are consistent with identified information needs.

Rural Development. Emphasize a diversity of opportunities for resource uses that contribute to the local and regional economies of Southeast Alaska. Work with local communities to identify rural development opportunities and provide leadership and technical assistance in their implementation.

Soils. Maintain soil productivity Forest-wide, and minimize soil erosion resulting from land-disturbing activities.

Subsistence. Provide for the continuation of customary and traditional subsistence uses and resources by all rural Alaskan residents.

Water. Provide water of sufficient quality to meet or exceed Alaska State Water Quality Standards for designated beneficial uses. Minimize sediment transported to streams from land-disturbing activities.

Wetlands. Minimize the destruction, loss or degradation of wetlands, and preserve and enhance the associated wetland functions and values.

Wilderness and Legislated LUD II. Maintain a wilderness setting consistent with ANILCA on the 5.8 million acres of Wilderness on the Tongass. Manage the LUD II areas designated by the Tongass Timber Reform Act to retain their essentially undeveloped character.

Alternative 1

Theme

The theme of this alternative is to emphasize high-quality fish and wildlife habitat, unroaded areas, wild, scenic, and recreational rivers, scenic quality, subsistence use, and a wide range of recreation and tourism opportunities in a natural setting. Geographic areas mentioned in public comments as deserving of protection, and all identified recreation places, are assigned non-development LUD's.

Goals

Fish Habitat

Maintain and restore the natural range and frequency of aquatic habitat conditions Forest-wide to sustain the diversity and production of fish and other freshwater organisms. Reduce potential risks to fish habitat in the higher-quality watersheds.

Karst and Caves

Maintain and protect caves and karst ecosystems Forest-wide.

Minerals

Encourage the development of mineral resources in areas where other resource goals are not emphasized. Encourage environmentally sound mineral exploration, development and reclamation in areas open to mineral entry, and for valid existing rights in closed areas, while protecting other resource needs and values. Seek withdrawal of areas where mineral development is not allowed by a specific land use designation.

Recreation and Tourism

Provide a wide range of recreation opportunities in a natural setting, with emphasis on identified recreation places and areas identified by the public.

Scenery

Maintain visually-appealing scenery Forest-wide. Limit extensive landscape modifications to seldom-seen areas, consistent with the other resource goals.

Timber Management

Manage timber to maintain forest structure, function and dynamics similar to existing natural conditions. Within this context, provide opportunities for small-scale timber production using uneven-aged management systems.

Transportation and Utilities

Develop and manage roads as required to support resource management objectives. Allow the development of utility systems.

Wild and Scenic Rivers

Maintain the outstandingly remarkable features of rivers recommended for designation as components of the National Wild and Scenic Rivers System.

Wildlife Habitat

Maintain as much contiguous, undisturbed old-growth habitat as possible, with emphasis on identified high-value areas for old-growth associated species, to provide a high likelihood of insuring the maintenance of viable populations. Minimize adverse effects from human activities through road and facility management.

Objectives

Manage suitable timber lands using uneven-aged systems with an average management age of 200 years.

Apply riparian management option 2 to watersheds with the highest fisheries values (see Table 2-1); riparian management option 3 to the rest.

Use the full beach and estuary fringe standards and guidelines (1,000-foot beach corridor and 1,000-foot estuary corridor).

Apply the Forest-wide standards and guidelines for karst areas and caves.

Apply Forest-wide standards and guidelines for deer winter range.

Recommend 6 new Research Natural Areas, 16 new Special Interest Areas, and all 112 eligible Wild, Scenic and Recreational Rivers.

Do not apply the Minerals or Transportation and Utility Systems LUD's.

Table 2-2 (1)
Land Use Designation Allocations for Alternative 1 [1]

Land Use Designation	Acres Allocated	Suitable Acres [2]
Wilderness	2,622,953	
Wilderness National Monument	3,100,300	
Nonwilderness National Monument	163,654	
Research Natural Area	26,692	
Special Interest Area	173,863	
Remote Recreation	4,615,278	
Enacted Municipal Watershed	9,713	
Old-growth Habitat	63,676	
Semi-remote Recreation	4,876,992	
Land Use Designation II	719,582	
Wild, Scenic, Recreational River	331,605	
Experimental Forest	11,700	
Scenic Viewshed	819	
Modified Landscape	0	
Timber Production	222,091	74,047
Minerals	0	

[1] When more than one Land Use Designation is applied to the same area (such as a Special Interest Area within Wilderness), only the acreage of the more-restrictive LUD is included, except that Wilderness and Wilderness National Monument acres are always shown. For Minerals, which is always an overlay, areages are separately included. No acreages have been calculated for the Transportation and Utility Systems LUD.
[2] This column represents the suitable timber land acres within the LUD's that allow commercial timber harvest.

Table 2-3 (1)
Selected Dimensions of Alternative 1 [1]

Resource/Category	Output/Measure
Recreation Opportunity Spectrum Class: (recreation visitor days)	
Primitive and Semi-primitive Non-motorized	1,432,370
Semi-primitive Motorized	1,665,440
Roaded Natural and Roaded Modified	1,850,470
Recreation Construction/Reconstruction:	
Trails (miles)	(2)
Developed Sites (persons at one time)	(2)
Visual Quality Objectives: (acres, excluding Wilderness)	
Retention	5,920,967
Partial Retention	4,877,611
Modification	1,180
Maximum Modification	220,912
River Recommendations (miles):	
Wild River	1,085
Scenic River	154
Recreational River	55
Suitable Timber Lands (acres)	74,047
Allowable Sale Quantity: (million cubic feet/million board feet) [3]	
Non-interchangeable component I	0/0
Non-interchangeable component II	0/0
Total	0/0
Timber Harvest by System (acres):	
Even-aged (clearcut) management	0
Two-aged management	0
Uneven-aged management	0
Precommercial thinning (acres)	0
Road Construction (miles)	0
Fish/Wildlife Improvement Projects:	
Fish projects (number)	(2)
Fish production (pounds)	(2)
Non-structural wildlife projects (acres)	(2)
Structural wildlife projects (number)	(2)
Total Budget (dollars)	65,005,278

(1) All figures are average annual amounts for the first decade (1996-2005) except for visual quality objectives, river recommendations, and tentatively suitable timber lands.
(2) These figures will be based on the resource schedules developed for the final plan. They are anticipated to be similar to those in the 1991 SDEIS, and would not vary by alternative.
(3) For each category two equivalent figures are given: the first is volume expressed in million cubic feet, the second the same volume expressed in million board feet. All timber volumes are sawlogs plus utility.

Alternative 2

Theme

The theme of this alternative is to emphasize scenery, recreation and tourism, subsistence uses, and timber production. Many of the more important wildlife habitats, recreation and subsistence opportunities, and scenic values will be maintained in a natural setting. Resources that will contribute to the local and regional economies of Southeast Alaska are emphasized.

Goals

Fish Habitat

Maintain and restore the natural range and frequency of aquatic habitat conditions Forest-wide to sustain the diversity and production of fish and other freshwater organisms.

Karst and Caves

Protect caves, and maintain selected karst features.

Minerals

Emphasize the development of mineral resources in areas with high development potential. Encourage environmentally sound mineral exploration, development and reclamation in areas open to mineral entry, and for valid existing rights in closed areas, while protecting other resource needs and values. Seek withdrawal of areas where mineral development is not allowed by a specific land use designation.

Recreation and Tourism

Provide a range of recreation opportunities consistent with public demand, with emphasis on recreation places identified as being popular with local users or important to the tourism industry.

Scenery

Provide Forest visitors with visually appealing scenery, with emphasis on areas seen along the Alaska Marine Highway, State highways and major Forest roads, and popular recreation places. In other areas, where landscapes are altered by management activities, the activity may dominate the characteristic landscape.

Timber Management

Manage the timber resource for the production of sawtimber and other wood products from suitable timber lands made available for timber harvest, on an even-flow, long-term sustained yield basis and in an economically efficient manner. Seek to provide a timber supply sufficient to meet the annual market demand for timber, and the market demand for the planning cycle.

Transportation and Utilities

Develop and manage roads to support resource management activities. Recognize the potential for the future development of major transportation and utility systems.

Wild and Scenic Rivers

Maintain the outstandingly remarkable features of rivers recommended for designation as components of the National Wild and Scenic Rivers System.

Wildlife Habitat

Maintain contiguous old-growth habitat in selected areas, and provide some likelihood of insuring the maintenance of viable populations. Minimize adverse impacts from human activities through road and facility management.

Objectives

Manage suitable timber lands using even-aged systems with an average rotation age of 100 years.

Apply riparian management option 3 to all watersheds.

Apply beach and estuary fringe standards and guidelines (500-foot beach corridor and 1,000-foot estuary corridor).

Use the Forest-wide standards and guidelines for caves from the 1992 FEIS.

Recommend 6 new Research Natural Areas, 16 new Special Interest Areas, and 25 Wild, Scenic and Recreational Rivers.

Apply the Minerals LUD to 12 mineral activity tracts with high development potential.

Apply the Transportation and Utility Systems LUD to selected State-identified potential highways and utility transmission corridors.

Table 2-2 (2)
Land Use Designation Allocations for Alternative 2 [1]

Land Use Designation	Acres Allocated	Suitable Acres [2]
Wilderness	2,622,953	
Wilderness National Monument	3,100,300	
Nonwilderness National Monument	163,654	
Research Natural Area	26,692	
Special Interest Area	173,863	
Remote Recreation	2,344,238	
Enacted Municipal Watershed	9,713	
Old-growth Habitat	49,705	
Semi-remote Recreation	2,467,523	
Land Use Designation II	719,582	
Wild, Scenic, Recreational River	90,545	
Experimental Forest	17,500	
Scenic Viewshed	814,980	268,653
Modified Landscape	855,922	259,983
Timber Production	3,481,748	997,819
Minerals	166,215	

[1] When more than one Land Use Designation is applied to the same area (such as a Special Interest Area within Wilderness), only the acreage of the more-restrictive LUD is included, except that Wilderness and Wilderness National Monument acres are always shown. For Minerals, which is always an overlay, areages are separately included. No acreages have been calculated for the Transportation and Utility Systems LUD.
[2] This column represents the suitable timber land acres within the LUD's that allow commercial timber harvest.

Table 2-3 (2)
Selected Dimensions of Alternative 2 [1]

Resource/Category	Output/Measure
Recreation Opportunity Spectrum Class: (recreation visitor days)	
Primitive and Semi-primitive Non-motorized	1,376,720
Semi-primitive Motorized	1,611,520
Roaded Natural and Roaded Modified	1,954,530
Recreation Construction/Reconstruction:	
Trails (miles)	[2]
Developed Sites (persons at one time)	[2]
Visual Quality Objectives: (acres, excluding Wilderness)	
Retention	3,551,073
Partial Retention	3,079,740
Modification	452,668
Maximum Modification	3,944,635
River Recommendations (miles):	
Wild River	287.5
Scenic River	86.5
Recreational River	57
Suitable Timber Lands (acres)	1,526,455
Allowable Sale Quantity: (million cubic feet/million board feet) [3]	
Non-interchangeable component I	100/406
Non-interchangeable component II	20/82
Total	120/489
Timber Harvest by System (acres):	
Even-aged (clearcut) management	16,767
Two-aged management	0
Uneven-aged management	0
Precommercial thinning (acres)	6,300
Road Construction (miles)	179
Fish/Wildlife Improvement Projects:	
Fish projects (number)	[2]
Fish production (pounds)	[2]
Non-structural wildlife projects (acres)	[2]
Structural wildlife projects (number)	[2]
Total Budget (dollars)	92,929,038

[1] All figures are average annual amounts for the first decade (1996-2005) except for visual quality objectives, river recommendations, and tentatively suitable timber lands.
[2] These figures will be based on the resource schedules developed for the final plan. They are anticipated to be similar to those in the 1991 SDEIS, and would not vary by alternative.
[3] For each category two equivalent figures are given: the first is volume expressed in million cubic feet, the second the same volume expressed in million board feet. All timber volumes are sawlog plus utility.

Alternative 3

Theme

This alternative provides a mix of National Forest uses and activities similar to Alternative 2, with additional emphasis on fish and wildlife habitat protection and the karst and caves resource, and less emphasis on some resource uses contributing to the local and regional economies of Southeast Alaska.

Goals

Fish Habitat

Maintain and restore the natural range and frequency of aquatic habitat conditions Forest-wide to sustain the diversity and production of fish and other freshwater organisms. Reduce potential risks to fish habitat in all watersheds.

Karst and Caves

Maintain and protect caves and karst ecosystems Forest-wide.

Minerals

Emphasize the development of mineral resources in areas with high development potential. Encourage environmentally sound mineral exploration, development and reclamation in areas open to mineral entry, and for valid existing rights in closed areas, while protecting other resource needs and values. Seek withdrawal of areas where mineral development is not allowed by a specific land use designation.

Recreation and Tourism

Provide a range of recreation opportunities consistent with public demand, with emphasis on recreation places identified as being popular with local users or important to the tourism industry.

Scenery

Provide Forest visitors with visually appealing scenery, with emphasis on areas seen along the Alaska Marine Highway, State highways and major Forest roads, and popular recreation places. In other areas, where landscapes are altered by management activities, the activity may dominate the characteristic landscape.

Timber Management

Manage the timber resource for production of sawtimber and other wood products from suitable timber lands made available for timber harvest, on an even-flow, long-term sustained yield basis and in an economically efficient manner. Seek to provide a timber supply sufficient to meet the annual market demand for timber, and the market demand for the planning cycle.

Transportation and Utilities

Develop and manage roads and utility system opportunities to support resource management activities. Recognize the potential for future development of major transportation and utility systems.

Wild and Scenic Rivers

Maintain the outstandingly remarkable features of rivers recommended for designation as components of the National Wild and Scenic Rivers System.

Wildlife Habitat

Maintain a system of old-growth habitat areas to provide a moderately-high likelihood of insuring the maintenance of viable populations. Minimize adverse impacts from human activities through road and facility management.

Objectives

Manage suitable timber lands using two-aged systems with an average management age of 100 years.

Apply riparian management option 1 to watersheds with the highest fisheries values (see Table 2-1); riparian management option 2 to the rest.

Apply a Forest-wide system of large, medium, and small old-growth reserves following the criteria in the Old-growth Habitat LUD.

Use the full beach and estuary fringe standards and guidelines (1,000-foot beach corridor and 1,000-foot estuary corridor).

Forest-wide standards and guidelines for karst areas and caves are applied.

Apply Forest-wide standards and guidelines for deer winter range.

Recommend 6 new Research Natural Areas, 16 new Special Interest Areas, and 25 Wild, Scenic and Recreational Rivers.

Apply the Minerals LUD to 12 mineral activity tracts with high development potential.

Apply the Transportation and Utility Systems LUD to selected State-identified potential highways and utility transmission corridors.

Table 2-2 (3)
Land Use Designation Allocations for Alternative 3 [1]

Land Use Designation	Acres Allocated	Suitable Acres [2]
Wilderness	2,622,953	
Wilderness National Monument	3,100,300	
Nonwilderness National Monument	163,654	
Research Natural Area	26,692	
Special Interest Area	173,863	
Remote Recreation	2,344,238	
Enacted Municipal Watershed	9,713	
Old-growth Habitat	964,639	
Semi-remote Recreation	2,467,523	
Land Use Designation II	719,582	
Wild, Scenic, Recreational River	90,545	
Experimental Forest	17,500	
Scenic Viewshed	576,673	182,481
Modified Landscape	680,230	199,801
Timber Production	2,980,813	805,830
Minerals	166,215	

[1] When more than one Land Use Designation is applied to the same area (such as a Special Interest Area within Wilderness), only the acreage of the more-restrictive LUD is included, except that Wilderness and Wilderness National Monument acres are always shown. For Minerals, which is always an overlay, areages are separately included. No acreages have been calculated for the Transportation and Utility Systems LUD.
[2] This column represents the suitable timber land acres within the LUD's that allow commercial timber harvest.

Table 2-3 (3)
Selected Dimensions of Alternative 3 [1]

Resource/Category	Output/Measure
Recreation Opportunity Spectrum Class: (recreation visitor days)	
Primitive and Semi-primitive Non-motorized	1,397,720
Semi-primitive Motorized	1,628,320
Roaded Natural and Roaded Modified	1,915,780
Recreation Construction/Reconstruction:	
Trails (miles)	(2)
Developed Sites (persons at one time)	(2)
Visual Quality Objectives: (acres, excluding Wilderness)	
Retention	4,422,726
Partial Retention	2,908,900
Modification	366,293
Maximum Modification	3,330,198
River Recommendations (miles):	
Wild River	287.5
Scenic River	86.5
Recreational River	57
Suitable Timber Lands (acres)	1,188,112
Allowable Sale Quantity: (million cubic feet/million board feet) [3]	
Non-interchangeable component I	57/232
Non-interchangeable component II	11/46
Total	68/278
Timber Harvest by System (acres):	
Even-aged (clearcut) management	0
Two-aged management	9,386
Uneven-aged management	48
Precommercial thinning (acres)	6,300
Road Construction (miles)	121
Fish/Wildlife Improvement Projects:	
Fish projects (number)	(2)
Fish production (pounds)	(2)
Non-structural wildlife projects (acres)	(2)
Structural wildlife projects (number)	(2)
Total Budget (dollars)	81,347,538

(1) All figures are average annual amounts for the first decade (1996-2005) except for visual quality objectives, river recommendations, and tentatively suitable timber lands.
(2) These figures will be based on the resource schedules developed for the final plan. They are anticipated to be similar to those in the 1991 SDEIS, and would not vary by alternative.
(3) For each category two equivalent figures are given: the first is volume expressed in million cubic feet, the second the same volume expressed in million board feet. All timber volumes are sawlog plus utility.

Alternative 4

Theme

This alternative provides a mix of National Forest uses and activities similar to Alternative 2, with additional emphasis on fish and wildlife habitat protection and the karst and caves resource, and less emphasis on some resource uses contributing to the local and regional economies of Southeast Alaska.

Goals

Fish Habitat

Maintain and restore the natural range and frequency of aquatic habitat conditions Forest-wide to sustain the diversity and production of fish and other freshwater organisms. Reduce potential risks to fish habitat in the higher-quality watersheds.

Karst and Caves

Maintain and protect caves and karst ecosystems Forest-wide.

Minerals

Emphasize the development of mineral resources in areas with high development potential. Encourage environmentally sound mineral exploration, development and reclamation in areas open to mineral entry, and for valid existing rights in closed areas, while protecting other resource needs and values. Seek withdrawal of areas where mineral development is not allowed by a specific land use designation.

Recreation and Tourism

Provide a range of recreation opportunities consistent with public demand, with emphasis on recreation places identified as being popular with local users or important to the tourism industry.

Scenery

Provide Forest visitors with visually appealing scenery, with emphasis on areas seen along the Alaska Marine Highway, State highways and major Forest roads, and popular recreation places. In other areas, where landscapes are altered by management activities, the activity may dominate the characteristic landscape.

Timber Management

Manage the timber resource for the production of sawtimber and other wood products from suitable timber lands made available for timber harvest, on an even-flow, long-term sustained yield basis and in an economically efficient manner. Seek to provide a timber supply sufficient to meet the annual market demand for timber, and the market demand for the planning cycle.

Transportation and Utilities

Develop and manage roads and utility system opportunities to support resource management activities. Recognize the potential for the future development of major transportation and utility systems.

Wild and Scenic Rivers

Maintain the outstandingly remarkable features of rivers recommended for designation as components of the National Wild and Scenic Rivers System.

Wildlife Habitat

Maintain as much contiguous old-growth habitat as possible for old-growth associated species to provide a high likelihood of insuring the maintenance of viable populations. Minimize adverse impacts from human activities through road and facility management.

Objectives

Manage suitable timber lands using two-aged systems with an average management age of 200 years.

Within each VCU where timber harvest is scheduled: harvest no more than 25 percent of the productive old growth during any 50-year period; retain a minimum of 33 percent of the VCU in an old-growth forest condition.

Apply riparian management option 2 to watersheds with the highest fisheries values (see Table 2-1); riparian management option 3 to the rest.

Use the full beach and estuary fringe standards and guidelines (1,000-foot beach corridor and 1,000-foot estuary corridor).

Forest-wide standards and guidelines for karst areas and caves are applied.

Apply Forest-wide standards and guidelines for deer winter range.

Recommend 6 new Research Natural Areas, 16 new Special Interest Areas, and 25 Wild, Scenic and Recreational Rivers.

Apply the Minerals LUD to 12 mineral activity tracts with high development potential.

Apply the Transportation and Utility Systems LUD to selected State-identified potential highways and utility transmission corridors.

Table 2-2 (4)
Land Use Designation Allocations for Alternative 4 [1]

Land Use Designation	Acres Allocated	Suitable Acres [2]
Wilderness	2,622,953	
Wilderness National Monument	3,100,300	
Nonwilderness National Monument	163,654	
Research Natural Area	26,692	
Special Interest Area	173,863	
Remote Recreation	2,344,238	
Enacted Municipal Watershed	9,713	
Old-growth Habitat	49,705	
Semi-remote Recreation	2,467,523	
Land Use Designation II	719,582	
Wild, Scenic, Recreational River	90,545	
Experimental Forest	17,500	
Scenic Viewshed	814,980	266,073
Modified Landscape	855,922	257,042
Timber Production	3,481,748	983,408
Minerals	166,215	

[1] When more than one Land Use Designation is applied to the same area (such as a Special Interest Area within Wilderness), only the acreage of the more-restrictive LUD is included, except that Wilderness and Wilderness National Monument acres are always shown. For Minerals, which is always an overlay, areages are separately included. No acreages have been calculated for the Transportation and Utility Systems LUD.
[2] This column represents the suitable timber land acres within the LUD's that allow commercial timber harvest.

Table 2-3 (4)
Selected Dimensions of Alternative 4 [(1)]

Resource/Category	Output/Measure
Recreation Opportunity Spectrum Class: (recreation visitor days)	
Primitive and Semi-primitive Non-motorized	1,404,920
Semi-primitive Motorized	1,638,610
Roaded Natural and Roaded Modified	1,901,310
Recreation Construction/Reconstruction:	
Trails (miles)	(2)
Developed Sites (persons at one time)	(2)
Visual Quality Objectives: (acres, excluding Wilderness)	
Retention	3,551,073
Partial Retention	3,079,740
Modification	452,668
Maximum Modification	3,944,635
River Recommendations (miles):	
Wild River	287.5
Scenic River	86.5
Recreational River	57
Suitable Timber Lands (acres)	1,506,523
Allowable Sale Quantity: (million cubic feet/million board feet) [(3)]	
Non-interchangeable component I	30/121
Non-interchangeable component II	6/24
Total	36/145
Timber Harvest by System (acres):	
Even-aged (clearcut) management	0
Two-aged management	4,943
Uneven-aged management	0
Precommercial thinning (acres)	3,150
Road Construction (miles)	63
Fish/Wildlife Improvement Projects:	
Fish projects (number)	(2)
Fish production (pounds)	(2)
Non-structural wildlife projects (acres)	(2)
Structural wildlife projects (number)	(2)
Total Budget (dollars)	74,012,588

[(1)] All figures are average annual amounts for the first decade (1996-2005) except for visual quality objectives, river recommendations, and tentatively suitable timber lands.
[(2)] These figures will be based on the resource schedules developed for the final plan. They are anticipated to be similar to those in the 1991 SDEIS, and would not vary by alternative.
[(3)] For each category two equivalent figures are given: the first is volume expressed in million cubic feet, the second the same volume expressed in million board feet. All timber volumes are sawlog plus utility.

Alternative 5

Theme

This alternative provides a mix of National Forest uses and activities similar to Alternative 2, with additional emphasis on fish and wildlife habitat protection and the karst and caves resource, and less emphasis on some resource uses contributing to the local and regional economies of Southeast Alaska.

Goals

Fish Habitat

Maintain and restore the natural range and frequency of aquatic habitat conditions Forest-wide to sustain the diversity and production of fish and other freshwater organisms. Reduce potential risks to fish habitat in the higher-quality watersheds.

Karst and Caves

Maintain and protect caves and karst ecosystems Forest-wide.

Minerals

Emphasize the development of mineral resources in areas with high development potential. Encourage environmentally sound mineral exploration, development and reclamation in areas open to mineral entry, and for valid existing rights in closed areas, while protecting other resource needs and values. Seek withdrawal of areas where mineral development is not allowed by a specific land use designation.

Recreation and Tourism

Provide a range of recreation opportunities consistent with public demand, with emphasis on recreation places identified as being popular with local users or important to the tourism industry.

Scenery

Provide Forest visitors with visually appealing scenery, with emphasis on areas seen along the Alaska Marine Highway, State highways and major Forest roads, and popular recreation places. In other areas, where landscapes are altered by management activities, the activity may dominate the characteristic landscape.

Timber Management

Manage the timber resource for the production of sawtimber and other wood products from suitable timber lands made available for timber harvest, on an even-flow, long-term sustained yield basis and in an economically efficient manner. Seek to provide a timber supply sufficient to meet the annual market demand for timber, and the market demand for the planning cycle.

Transportation and Utilities

Develop and manage roads and utility system opportunities to support resource management activities. Recognize the potential for the future development of major transportation and utility systems.

Wild and Scenic Rivers

Maintain the outstandingly remarkable features of rivers recommended for designation as components of the National Wild and Scenic Rivers System.

Wildlife Habitat

Maintain as much contiguous old-growth habitat as possible for old-growth associated species to provide a high likelihood of insuring the maintenance of viable populations. Minimize adverse impacts from human activities through road and facility management.

Objectives

Manage suitable timber lands using uneven-aged and two-aged systems with an average management age of 200 years.

Apply a system of large, medium, and small old-growth reserves, or individual reserves, to the biogeographic provinces and other areas specified in Table 2-1.

Within each VCU where timber harvest is scheduled: harvest no more than 25 percent of the productive old growth during any 50-year period; retain a minimum of 33 percent of the VCU in an old-growth forest condition.

Apply riparian management option 2 to watersheds with the highest fisheries values (see Table 2-1); riparian management option 3 to the rest.

Use the full beach and estuary fringe standards and guidelines (1,000-foot beach corridor and 1,000-foot estuary corridor).

Forest-wide standards and guidelines for karst areas and caves are applied.

Apply Forest-wide standards and guidelines for deer winter range.

Recommend 6 new Research Natural Areas, 16 new Special Interest Areas, and 25 Wild, Scenic and Recreational Rivers.

Apply the Minerals LUD to 12 mineral activity tracts with high development potential.

Apply the Transportation and Utility Systems LUD to selected State-identified potential highways and utility transmission corridors.

Table 2-2 (5)
Land Use Designation Allocations for Alternative 5 [1]

Land Use Designation	Acres Allocated	Suitable Acres [2]
Wilderness	2,622,953	
Wilderness National Monument	3,100,300	
Nonwilderness National Monument	163,654	
Research Natural Area	26,692	
Special Interest Area	173,863	
Remote Recreation	2,344,238	
Enacted Municipal Watershed	9,713	
Old-growth Habitat	386,289	
Semi-remote Recreation	2,467,523	
Land Use Designation II	719,582	
Wild, Scenic, Recreational River	90,545	
Experimental Forest	17,500	
Scenic Viewshed	760,511	241,909
Modified Landscape	760,682	228,883
Timber Production	3,294,873	928,724
Minerals	166,215	

[1] When more than one Land Use Designation is applied to the same area (such as a Special Interest Area within Wilderness), only the acreage of the more-restrictive LUD is included, except that Wilderness and Wilderness National Monument acres are always shown. For Minerals, which is always an overlay, areages are separately included. No acreages have been calculated for the Transportation and Utility Systems LUD.
[2] This column represents the suitable timber land acres within the LUD's that allow commercial timber harvest.

Table 2-3 (5)
Selected Dimensions of Alternative 5 [1]

Resource/Category	Output/Measure
Recreation Opportunity Spectrum Class: (recreation visitor days)	
Primitive and Semi-primitive Non-motorized	1,408,360
Semi-primitive Motorized	1,640,790
Roaded Natural and Roaded Modified	1,892,090
Recreation Construction/Reconstruction:	
Trails (miles)	[2]
Developed Sites (persons at one time)	[2]
Visual Quality Objectives: (acres, excluding Wilderness)	
Retention	3,881,020
Partial Retention	3,041,219
Modification	421,656
Maximum Modification	3,684,220
River Recommendations (miles):	
Wild River	287.5
Scenic River	86.5
Recreational River	57
Suitable Timber Lands (acres)	1,399,516
Allowable Sale Quantity: (million cubic feet/million board feet) [3]	
Non-interchangeable component I	28/114
Non-interchangeable component II	6/24
Total	34/139
Timber Harvest by System (acres):	
Even-aged (clearcut) management	0
Two-aged management	4,712
Uneven-aged management	0
Precommercial thinning (acres)	3,150
Road Construction (miles)	60
Fish/Wildlife Improvement Projects:	
Fish projects (number)	[2]
Fish production (pounds)	[2]
Non-structural wildlife projects (acres)	[2]
Structural wildlife projects (number)	[2]
Total Budget (dollars)	73,681,688

[1] All figures are average annual amounts for the first decade (1996-2005) except for visual quality objectives, river recommendations, and tentatively suitable timber lands.
[2] These figures will be based on the resource schedules developed for the final plan. They are anticipated to be similar to those in the 1991 SDEIS, and would not vary by alternative.
[3] For each category two equivalent figures are given: the first is volume expressed in million cubic feet, the second the same volume expressed in million board feet. All timber volumes are sawlog plus utility.

Alternative 6

Theme

This alternative provides a mix of National Forest uses and activities similar to Alternative 2, with additional emphasis on fish and wildlife habitat protection and the karst and caves resource, and more emphasis than Alternative 3-5 on resources contributing to the local and regional economies of Southeast Alaska.

Goals

Fish Habitat

Maintain and restore the natural range and freqency of aquatic habitat conditions Forest-wide to sustain the diversity and production of fish and other freshwater organisms. Reduce potential risks to fish habitat in the higher-quality watersheds.

Karst and Caves

Maintain and protect caves and karst ecosystems Forest-wide.

Minerals

Emphasize the development of mineral resources in areas with high development potential. Encourage environmentally sound mineral exploration, development and reclamation in areas open to mineral entry, and for valid existing rights in closed areas, while protecting other resource needs and values. Seek withdrawal of areas where mineral development is not allowed by a specific land use designation.

Recreation and Tourism

Provide a range of recreation opportunities consistent with public demand, with emphasis on recreation places identified as being popular with local users or important to the tourism industry.

Scenery

Provide Forest visitors with visually appealing scenery, with emphasis on areas seen along the Alaska Marine Highway, State highways and major Forest roads, and popular recreation areas. In other areas, where landscapes are altered by management activities, the activity may dominate the characteristic landscape.

Timber Management

Manage the timber resource for the production of sawtimber and other wood products from suitable timber lands made available for timber harvest, on an even-flow, long-term sustained yield basis and in an economically efficient manner. Seek to provide a timber supply sufficient to meet the annual market demand for timber, and the market demand for the planning cycle.

Transportation and Utilities

Develop and manage roads and utility system opportunities to support resource management activities. Recognize the potential for the future development of major transportation and utility systems.

Wild and Scenic Rivers

Maintain the outstandingly remarkable features of rivers recommended for designation as components of the National Wild and Scenic Rivers System.

Wildlife Habitat

Maintain contiguous old-growth habitat for old-growth associated species, and provide a moderate likelihood of insuring the maintenance of viable populations. Minimize adverse impacts from human activities through road and facility management.

Objectives

Manage suitable timber lands using uneven-aged and two-aged systems with an average management age of 100 years.

Apply a system of large, medium, and small old-growth reserves, or individual reserves, to the biogeographic provinces and other areas specified in Table 2-1.

Within each VCU where timber harvest is scheduled: harvest no more than 50 percent of the productive old growth during any 50-year period; retain a minimum of 33 percent of the VCU in an old-growth forest condition.

Apply riparian management option 2 to watersheds with the highest fisheries values (see Table 2-1); riparian management option 3 to the rest.

Use the full beach and estuary fringe standards and guidelines (1,000-foot beach corridor and 1,000-foot estuary corridor).

Forest-wide standards and guidelines for karst areas and caves are applied.

Apply Forest-wide standards and guidelines for deer winter range.

Recommend 6 new Research Natural Areas, 16 new Special Interest Areas, and 25 Wild, Scenic and Recreational Rivers.

Apply the Minerals LUD to 12 mineral activity tracts with high development potential.

Apply the Transportation and Utility Systems LUD to selected State-identified potential highways and utility transmission corridors.

Table 2-2 (6)
Land Use Designation Allocations for Alternative 6 [1]

Land Use Designation	Acres Allocated	Suitable Acres [2]
Wilderness	2,622,953	
Wilderness National Monument	3,100,300	
Nonwilderness National Monument	163,654	
Research Natural Area	26,692	
Special Interest Area	173,863	
Remote Recreation	2,344,238	
Enacted Municipal Watershed	9,713	
Old-growth Habitat	386,289	
Semi-remote Recreation	2,467,523	
Land Use Designation II	719,582	
Wild, Scenic, Recreational River	90,545	
Experimental Forest	17,500	
Scenic Viewshed	760,511	241,909
Modified Landscape	760,682	228,883
Timber Production	3,294,873	928,724
Minerals	166,215	

[1] When more than one Land Use Designation is applied to the same area (such as a Special Interest Area within Wilderness), only the acreage of the more-restrictive LUD is included, except that Wilderness and Wilderness National Monument acres are always shown. For Minerals, which is always an overlay, areages are separately included. No acreages have been calculated for the Transportation and Utility Systems LUD.
[2] This column represents the suitable timber land acres within the LUD's that allow commercial timber harvest.

Table 2-3 (6)
Selected Dimensions of Alternative 6 [1]

Resource/Category	Output/Measure
Recreation Opportunity Spectrum Class: (recreation visitor days)	
Primitive and Semi-primitive Non-motorized	1,384,260
Semi-primitive Motorized	1,615,940
Roaded Natural and Roaded Modified	1,934,090
Recreation Construction/Reconstruction:	
Trails (miles)	(2)
Developed Sites (persons at one time)	(2)
Visual Quality Objectives: (acres, excluding Wilderness)	
Retention	3,955,923
Partial Retention	3,004,871
Modification	416,157
Maximum Modification	3,646,920
River Recommendations (miles):	
Wild River	287.5
Scenic River	86.5
Recreational River	57
Suitable Timber Lands (acres)	1,399,516
Allowable Sale Quantity: (million cubic feet/million board feet) [3]	
Non-interchangeable component I	74/300
Non-interchangeable component II	15/62
Total	89/362
Timber Harvest by System (acres):	
Even-aged (clearcut) management	0
Two-aged management	12,318
Uneven-aged management	0
Precommercial thinning (acres)	6,300
Road Construction (miles)	158
Fish/Wildlife Improvement Projects:	
Fish projects (number)	(2)
Fish production (pounds)	(2)
Non-structural wildlife projects (acres)	(2)
Structural wildlife projects (number)	(2)
Total Budget (dollars)	86,035,288

[1] All figures are average annual amounts for the first decade (1996-2005) except for visual quality objectives, river recommendations, and tentatively suitable timber lands.
[2] These figures will be based on the resource schedules developed for the final plan. They are anticipated to be similar to those in the 1991 SDEIS, and would not vary by alternative.
[3] For each category two equivalent figures are given: the first is volume expressed in million cubic feet, the second the same volume expressed in million board feet. All timber volumes are sawlog plus utility.

Alternative 7

Theme

The theme of this alternative is to provide an economic timber supply from public lands to meet market demand in Southeast Alaska. Management of other resources will be done in an efficient manner consistent with the emphasis on timber supply, and while meeting environmental standards. Some areas with low timber volumes will be managed with an emphasis on wildlife, subsistence, recreation, scenery and other non-commodity values.

Goals

Fish Habitat

Maintain and restore the natural range and frequency of aquatic habitat conditions Forest-wide to sustain the diversity and production of fish and other freshwater organisms.

Karst and Caves

Protect caves, and maintain selected karst features.

Minerals

Emphasize the development of mineral resources in areas with known development potential. Encourage environmentally sound mineral exploration, development and reclamation in areas open to mineral entry, and for valid existing rights in closed areas, while protecting other resource needs and values.

Recreation and Tourism

Provide recreation and tourism opportunities consistent with the emphasis on timber production.

Scenery

Maintain visually appealing scenery in areas where timber production is not a goal. In areas where significant ground-disturbing activities will occur, allow extensively modified landscapes.

Timber Management

Manage the timber resource for the maximum production of sawtimber and related wood products from suitable timber lands made available for timber harvest, on an even-flow, long-term sustained yield basis and in an economically efficient manner. Seek to provide a timber supply sufficient to meet the annual market demand for timber, and the market demand for the planning cycle.

Transportation and Utilities

Develop and manage roads and utility system opportunities to support resource management activities. Recognize the potential for the future development of major transportation and utility systems.

Wild and Scenic Rivers

Maintain the outstandingly remarkable features of rivers recommended for designation as components of the National Wild and Scenic Rivers System.

Wildlife Habitat

Provide for diversity of plant and animal communities based on the suitability and capability of specific land areas to meet overall multiple-use objectives.

Objectives

Manage suitable timber lands using even-aged systems with an average rotation age of 100 years.

Apply riparian management option 3 to all watersheds.

The beach and estuary fringe standards and guidelines are not applied.

Use the Forest-wide standards and guidelines for caves from the 1992 FEIS.

Recommend 4 new Research Natural Areas, 2 new Special Interest Areas, and 11 Wild, Scenic and Recreational Rivers.

Apply the Minerals LUD to 23 mineral activity tracts with high development potential.

Apply the Transportation and Utility Systems LUD to selected State-identified potential highways and utility transmission corridors.

Table 2-2 (7)
Land Use Designation Allocations for Alternative 7 [1]

Land Use Designation	Acres Allocated	Suitable Acres [2]
Wilderness	2,622,953	
Wilderness National Monument	3,100,300	
Nonwilderness National Monument	163,654	
Research Natural Area	23,510	
Special Interest Area	21,084	
Remote Recreation	1,236,907	
Enacted Municipal Watershed	9,713	
Old-growth Habitat	0	
Semi-remote Recreation	1,204,406	
Land Use Designation II	719,582	
Wild, Scenic, Recreational River	0	
Experimental Forest	17,500	
Scenic Viewshed	0	
Modified Landscape	1,483,599	114,644
Timber Production	6,335,710	1,929,520
Minerals	291,030	

[1] When more than one Land Use Designation is applied to the same area (such as a Special Interest Area within Wilderness), only the acreage of the more-restrictive LUD is included, except that Wilderness and Wilderness National Monument acres are always shown. For Minerals, which is always an overlay, areages are separately included. No acreages have been calculated for the Transportation and Utility Systems LUD.
[2] This column represents the suitable timber land acres within the LUD's that allow commercial timber harvest.

Table 2-3 (7)
Selected Dimensions of Alternative 7 [1]

Resource/Category	Output/Measure
Recreation Opportunity Spectrum Class: (recreation visitor days)	
Primitive and Semi-primitive Non-motorized	1,339,220
Semi-primitive Motorized	1,507,480
Roaded Natural and Roaded Modified	2,041,820
Recreation Construction/Reconstruction:	
Trails (miles)	[2]
Developed Sites (persons at one time)	[2]
Visual Quality Objectives: (acres, excluding Wilderness)	
Retention	1,994,765
Partial Retention	1,288,071
Modification	1,010,389
Maximum Modification	6,725,256
River Recommendations (miles):	
Wild River	211
Scenic River	0
Recreational River	0
Suitable Timber Lands (acres)	2,044,164
Allowable Sale Quantity: (million cubic feet/million board feet) [3]	
Non-interchangeable component I	141/577
Non-interchangeable component II	27/112
Total	169/689
Timber Harvest by System (acres):	
Even-aged (clearcut) management	23,207
Two-aged management	0
Uneven-aged management	35
Precommercial thinning (acres)	6,300
Road Construction (miles)	298
Fish/Wildlife Improvement Projects:	
Fish projects (number)	[2]
Fish production (pounds)	[2]
Non-structural wildlife projects (acres)	[2]
Structural wildlife projects (number)	[2]
Total Budget (dollars)	103,738,438

[1] All figures are average annual amounts for the first decade (1996-2005) except for visual quality objectives, river recommendations, and tentatively suitable timber lands.
[2] These figures will be based on the resource schedules developed for the final plan. They are anticipated to be similar to those in the 1991 SDEIS, and would not vary by alternative.
[3] For each category two equivalent figures are given: the first is volume expressed in million cubic feet, the second the same volume expressed in million board feet. All timber volumes are sawlog plus utility.

Alternative 8

Theme

This alternative emphasizes an economic supply of timber from National Forest lands similar to Alternative 8, while also emphasizing fish and wildlife habitat protection.

Goals

Fish Habitat

Maintain and restore the natural range and frequency of aquatic habitat conditions Forest-wide to sustain the diversity and production of fish and other freshwater organisms. Reduce potential risks to fish habitat in the higher-quality watersheds.

Karst and Caves

Protect caves, and maintain selected karst features.

Minerals

Emphasize the development of mineral resources in areas with known development potential. Encourage environmentally sound mineral exploration, development and reclamation in areas open to mineral entry, and for valid existing rights in closed areas, while protecting other resource needs and values.

Recreation and Tourism

Provide recreation and tourism opportunities consistent with the emphasis on timber production.

Scenery

Maintain visually appealing scenery in areas where timber production is not a goal. In areas where significant ground-disturbing activities will occur, allow extensively modified landscapes.

Timber Management

Manage the timber resource for the production of sawtimber and other wood products from suitable timber lands made available for timber harvest, on an even-flow, long-term sustained yield basis and in an economically efficient manner. Seek to provide a timber supply sufficient to meet the annual market demand for timber, and the market demand for the planning cycle.

Transportation and Utilities

Develop and manage roads and utility system opportunities to support resource management activities. Recognize the potential for the future development of major transportation and utility systems.

Wild and Scenic Rivers

Maintain the outstandingly remarkable features of rivers recommended for designation as components of the National Wild and Scenic Rivers System.

Wildlife Habitat

Provide for diversity of plant and animal communities based on the suitability and capability of specific land areas to meet overall multiple-use objectives, and provide a system of old-growth habitat areas.

Objectives

Manage suitable timber lands using two-aged systems with an average management age of 100 years.

Apply a Forest-wide system of large, medium, and small old-growth reserves following the criteria in the Old-growth Habitat LUD.

Apply riparian management option 2 to watersheds with the highest fisheries values (see Table 2-1); riparian management option 3 to the rest.

Use the full beach and estuary fringe standards and guidelines (1,000-foot beach corridor and 1,000-foot estuary corridor).

Use the Forest-wide standards and guidelines for caves from the 1992 FEIS.

Recommend 4 new Research Natural Areas, 2 new Special Interest Areas, and 11 Wild, Scenic and Recreational Rivers.

Apply the Minerals LUD to 23 mineral activity tracts with high development potential.

Apply the Transportation and Utility Systems LUD to selected State-identified potential highways and utility transmission corridors.

Table 2-2 (8)
Land Use Designation Allocations for Alternative 8 [(1)]

Land Use Designation	Acres Allocated	Suitable Acres [(2)]
Wilderness	2,622,953	
Wilderness National Monument	3,100,300	
Nonwilderness National Monument	163,654	
Research Natural Area	23,510	
Special Interest Area	21,084	
Remote Recreation	1,236,907	
Enacted Municipal Watershed	9,713	
Old-growth Habitat	1,393,175	
Semi-remote Recreation	1,204,406	
Land Use Designation II	719,582	
Wild, Scenic, Recreational River	0	
Experimental Forest	17,500	
Scenic Viewshed	0	
Modified Landscape	1,368,063	68,925
Timber Production	5,058,071	1,320,195
Minerals	291,030	

(1) When more than one Land Use Designation is applied to the same area (such as a Special Interest Area within Wilderness), only the acreage of the more-restrictive LUD is included, except that Wilderness and Wilderness National Monument acres are always shown. For Minerals, which is always an overlay, areages are separately included. No acreages have been calculated for the Transportation and Utility Systems LUD.
(2) This column represents the suitable timber land acres within the LUD's that allow commercial timber harvest.

Table 2-3 (8)
Selected Dimensions of Alternative 8 [1]

Resource/Category	Output/Measure
Recreation Opportunity Spectrum Class: (recreation visitor days)	
Primitive and Semi-primitive Non-motorized	1,381,040
Semi-primitive Motorized	1,609,010
Roaded Natural and Roaded Modified	1,949,650
Recreation Construction/Reconstruction:	
Trails (miles)	(2)
Developed Sites (persons at one time)	(2)
Visual Quality Objectives: (acres, excluding Wilderness)	
Retention	3,387,939
Partial Retention	1,271,095
Modification	767,556
Maximum Modification	5,591,891
River Recommendations (miles):	
Wild River	211
Scenic River	0
Recreational River	0
Suitable Timber Lands (acres)	1,389,120
Allowable Sale Quantity: (million cubic feet/million board feet) [3]	
Non-interchangeable component I	75/305
Non-interchangeable component II	14/59
Total	89/364
Timber Harvest by System (acres):	
Even-aged (clearcut) management	0
Two-aged management	12,325
Uneven-aged management	0
Precommercial thinning (acres)	6,300
Road Construction (miles)	159
Fish/Wildlife Improvement Projects:	
Fish projects (number)	(2)
Fish production (pounds)	(2)
Non-structural wildlife projects (acres)	(2)
Structural wildlife projects (number)	(2)
Total Budget (dollars)	86,035,288

(1) All figures are average annual amounts for the first decade (1996-2005) except for visual quality objectives, river recommendations, and tentatively suitable timber lands.
(2) These figures will be based on the resource schedules developed for the final plan. They are anticipated to be similar to those in the 1991 SDEIS, and would not vary by alternative.
(3) For each category two equivalent figures are given: the first is volume expressed in million cubic feet, the second the same volume expressed in million board feet. All timber volumes are sawlog plus utility.

Alternative 9 (No Action)

Theme

This is the "No Action" alternative which represents the management direction of the current Tongass Land Management Plan (as approved in 1979, comprehensively amended in 1986, and amended again in 1991 to reflect certain provisions of the Tongass Timber Reform Act of 1990). Under this alternative, the Tongass National Forest would continue to be managed under the current land allocations reflected in the Plan's four basic Land Use Designations (the LUD's and LUD variations previously described, as displayed on the enclosed map for Alternative 9 and in Appendix A), and related Plan direction. The related direction includes the Plan's Goals; Anticipated Outputs and an Allowable Sale Quantity; Standards and Guidelines (which are provided by the Alaska Regional Guide and currently applied Regional policies and guidance); Management Area direction (which includes Area-specific Managemet Direction/Emphasis statements; various scheduled management activities (which are now outdated); and some additional Standards and Guidelines); and requirements for Monitoring and Evaluating the on-going implementation of the Plan. This management direction is contained in the Plan (1986 Alaska Region Administrative Document Number 147 which amended and superceded the original 1979 Plan, as further amended in 1991), the 1991 TLMP map, and in the Alaska Regional Guide (1983 Alaska Region Administrative Document Number 126b) and Appendix B of its related Final Environmental Impact Statement. The land use opportunities provided by the current Plan's LUD allocations, as bounded by the related Plan direction, would continue to be available to Forest users under this alternative.

A total of 141 Management Areas were established by the current Plan. Each of these areas consists of one or more of the 867 Value Comparison Units (VCU's) the entire Forest was originally divided into for planning purposes. The VCU's are watersheds or small islands which averaged about 17,500 acres in size. The Management Areas, the VCU's they contain, and how the VCU's were allocated to the various LUD's are shown on the 1991 TLMP map.

In anticipation of protection measures that would be needed for certain wildlife, fish and visual resources when implementing the plan, a Retention Factor method was applied during the original planning process. Use of this method in calculating the Plan's 450 million board feet (average annual, net sawlog volume) Allowable Sale Quantity variously reduced the average of operable (and predominantly old-growth) forest land that might otherwise have been scheduled for timber harvest in each of the VCU's that were allocated to LUD's III and IV (under which commercial timber harvest is permitted). A total of 1.7 million acres of operable forest land were scheduled for harvest within VCU's allocated to LUD's III and IV. A total of 273,000 acres of operable forest land were retained to provide wildlife and fish habitat, and 244,000 acres were programmed for harvest over extended rotation periods for visual resource management purposes, as a result of applying the Retention Factor method.

Goals

The stated goals of the current Forest Plan (which have not been amended since 1986, and reflect the Plan's original goals) follow. The current Forest Plan does not have a stated goal for Karst and Caves. However, current management practices at the project level are protecting caves and maintaining selected karst features.

Fish

The goal is to maintain and enhance the natural fisheries resources by managing some of the highest quality watersheds in ways which would not modify them significantly. In those where major management activities will take place, adequate protection of the aquatic environment will be provided. In addition, it is the intent to take advantage of as many identified fisheries enhancement opportunities as possible.

Minerals

The goal is to facilitate the orderly development of mineral resources in accordance with current regulations and applicable laws.

Recreation

The goal is to provide a broad spectrum of recreation opportunities with emphasis on maintaining natural areas with the highest wildlife, sport fish, and dispersed recreation assets. (Note: The Recreation and the Tourism goals are intended to provide appropriate recreation opportunities for both resident and non-resident recreation publics. The improvement of recreation facilities to accommodate increasing tourism would also be oriented to satisfy local recreation needs, for example.)

Tourism

The goal is to improve recreation facilities and attractions near communities for the use of visitors to Southeast Alaska, by managing these areas with a high degree of protection for their natural attractive features while developing access and required recreation facilities.

Visual

The goal is to maintain the scenic qualities of the most highly viewed landscapes on the Forest by managing many of these areas in ways which would not modify them significantly. In those areas where management activity will take place, projects will be designed to be compatible with the natural elements of the visual resource.

Timber Management

The goal is to make enough timber available from National Forest lands to maintain current levels of timber-related employment within the context of the total timber available from other land ownerships. (Note: As originally established in this Plan, current levels of employment are based on average timber industry conditions that were prevalent during the 1970 to 1976 period. The legislative history of the Alaska National Interest Lands Act of 1980 (ANILCA) indicates the Congressional decisions relating to the supply of timber from the Tongass National Forest related to the employment generated from timber harvested on the National Forest.)

Hydroelectric Power

The goal is to facilitate the development of hydroelectric power sites with identified high development potential by managing those sites, and their attendant transmission corridors, in ways which will allow development of these facilities with due consideration of the other various resources.

Road Corridors

The goal is to insure that as many as possible of the potential road corridors identified by the Southeast Alaska Multimodal Transportation Study (an on-going study by the Alaska Department of Transportation during the 1976-1979 planning period) be managed to allow their development with due consideration of the various resources.

Wildlife

The goal is to maintain and enhance the natural productivitiy of the Forest's wildlife habitat by managing many of the highest quality areas in ways which would not significantly modify them. In those areas where major modifications will occur, those changes will be designed to have the least adverse effects possible on wildlife.

Objectives

Table 2-2 (9)
Land Use Designation Allocations for Alternative 9 [1]

Land Use Designation	Acres Allocated	Suitable Acres [2]
LUD I	5,671,680	
National Monument Nonwilderness	170,200	
Unallocated Released Lands	304,710	
Subtotal	**6,146,590**	
LUD II	2,437,880	
Legislated	722,480	
Unallocated Forest Additions	1,122,900	
Subtotal	**4,283,260**	
LUD III	2,304,320	
Special	148,380	
Subtotal	**2,452,700**	**655,762**
LUD IV	**3,824,450**	**1,213,491**

[1] These acreages are from the Land Allocation Summary on the 1991 TLMP map and do not reflect the current acreages contained in the Revision data base, which are used in describing this alternative throughout the rest of this document. While not shown on the TLMP map as LUD's, the Forest also contains six existing Research Natural Areas, various Special Interest Areas, an Enacted Municipal Watershed, and two Experimental Forests.
[2] This column represents the suitable timber land acres within the LUD's that allow commercial timber harvest.

Table 2-3 (9)
Selected Dimensions of Alternative 9 [1]

Resource/Category	Output/Measure
Recreation Opportunity Spectrum Class: (recreation visitor days)	
Primitive and Semi-primitive Non-motorized	1,355,120
Semi-primitive Motorized	1,532,830
Roaded Natural and Roaded Modified	1,997,560
Recreation Construction/Reconstruction:	
Trails (miles)	(2)
Developed Sites (persons at one time)	(2)
Visual Quality Objectives: (acres, excluding Wilderness)	
Retention	5,160,505
Partial Retention	1,090,184
Modification	354,184
Maximum Modification	4,413,637
River Recommendations (miles):	
Wild River	0
Scenic River	0
Recreational River	0
Suitable Timber Lands (acres)	1,869,253
Allowable Sale Quantity: (million cubic feet/million board feet) [3]	
Non-interchangeable component I	116/474
Non-interchangeable component II	10/39
Total	126/513
Timber Harvest by System (acres):	
Even-aged (clearcut) management	17,710
Two-aged management	0
Uneven-aged management	37
Precommercial thinning (acres)	6,300
Road Construction (miles)	264
Fish/Wildlife Improvement Projects:	
Fish projects (number)	(2)
Fish production (pounds)	(2)
Non-structural wildlife projects (acres)	(2)
Structural wildlife projects (number)	(2)
Total Budget (dollars)	94,362,938

(1) All figures are average annual amounts for the first decade (1996-2005) except for visual quality objectives, river recommendations, and tentatively suitable timber lands. For Alternative 9, many of the dimensions in this table have been created using the Revision database for purposes of alternative comparisons, and are not always reflective of what the Current Plan actually contains.
(2) These figures will be based on the resource schedules developed for the final plan. They are anticipated to be similar to those in the 1991 SDEIS, and would not vary by alternative.
(3) For each category two equivalent figures are given: the first is volume expressed in million cubic feet, the second the same volume expressed in million board feet. All timber volumes are sawlog plus utility.

Comparison of Alternatives

This section will briefly present comparisons of the nine alternatives just described in detail, primarily focused on the public issues and based on the effects analysis in Chapter 3. The five Revised Supplement issues, and issues from the 1991 SDEIS, where effects or alternative treatments are substantially different than in 1991, will both be discussed. Table 2-4 summarizes the land use designation allocations of the alternatives using LUD Group combinations. The four LUD Groups combine the individual LUD's in terms of similarities in management and/or potential effects, as described in the Introduction to Chapter 3. Table 2-5 includes some of the key outputs of the alternatives displayed in Tables 2-3(1-9). Both tables will be referred to in the following discussions. The reader is also referred back to Table 2-1, Alternative Component Options, which presents additional information about the alternatives in comparative form.

Table 2-4
Land Use Designation Group Comparisons (million acres) [1]

Alternative	Wilderness	Natural Setting	Moderate Development	Intensive Development
1	5.9	10.9	<0.1	0.2
2	5.9	5.8	1.7	3.6
3	5.9	6.7	1.3	3.1
4	5.9	5.8	1.7	3.6
5	5.9	6.1	1.5	3.5
6	5.9	6.1	1.5	3.5
7	5.9	3.0	1.5	6.6
8	5.9	4.4	1.4	5.3
9	5.9	4.9	2.3	3.8

[1] LUD Group combinations are described in the Introduction to Chapter 3 (Table 3-1). For Alternative 9, "Unallocated Released Lands" (Table 2-2(9)) are included with the Natural Setting group acres, and the acreages are based on the Revision database and not Table 2-2(9).

Wildlife Habitat and Wildlife Viability

The analysis of these issues in Chapter 3 includes both short-term and long-term considerations. Potential short-term effects focus on areas within the Tongass that are currently experiencing, or may experience within the next decade, significant adverse effects due to losses of old-growth habitat, and where current levels of deer harvesting (hunting) may not be sustainable. Alternative 1 schedules no additional timber harvesting. Alternatives 3, 5, 6 and 8 include old-growth reserve systems in all or most of the major geographic areas of concern, and Alternatives 4 and 5 would reduce potential effects by using extended timber harvest rotations. Alternatives 3, 4, 5 and 6 also maintain important deer winter range in areas where deer harvesting is high, to provide continued deer harvesting opportunities at current levels. Alternatives 2, 7 and 9 would be expected to exacerbate existing problems. (See Table 2-1 for alternative-specific wildlife habitat measures.) Subsistence use associated with deer hunting will be correspondingly affected.

Table 2-5
Selected alternative dimensions [1]

Resource/Category	1	2	3	4	5	6	7	8	9
					Alternative				
Recreation - ROS Opportunities (million RVD's)									
Primitive and Semi-primitive Non-motorized	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.4	1.4
Semi-primitive Motorized	1.7	1.6	1.6	1.6	1.6	1.6	1.5	1.6	1.5
Roaded Natural and Roaded Modified	1.9	2.0	1.9	1.9	1.9	1.9	2.0	1.9	2.0
Scenery - VQO's [2] (million acres):									
Retention	5.9	3.6	4.4	3.6	3.9	4.0	2.0	3.4	5.2
Partial Retention	4.9	3.1	2.9	3.1	3.0	3.0	1.3	1.3	1.1
Modification	<0.1	0.5	0.4	0.5	0.4	0.4	1.0	0.8	0.4
Maximum Modification	0.2	3.9	3.3	3.9	3.7	3.6	6.7	5.6	4.4
Timber:									
Suitable Lands (million acres)	<0.1	1.5	1.2	1.5	1.4	1.4	2.0	1.4	1.9
Sale Quantities (MMBF): [3]									
Non-interchangeable I	0	406	232	121	114	300	577	305	474
Non-interchangeable II	0	82	46	24	24	62	112	59	39
Allowable Sale Quantity	0	489	278	145	139	362	689	364	513
Silvicultural System (1,000 acres):									
Even-aged	0	16.8	0	0	0	0	23.2	0	17.7
Two-aged	0	0	9.4	4.9	4.7	12.3	0	12.3	0
Uneven-aged	0	0	<0.1	0	0	0	<0.1	0	<0.1

[1] Abbreviations used: ROS = recreation opportunity spectrum; RVD = recreation visitor day; VQO = visual quality objective; MMBF = million board feet. RVD's, sale quantities, and silvicultural system acreages are average annual amounts.
[2] Excluding Wilderness (5.7 million acres of Retention in all alternatives).
[3] All timber volumes are sawlog plus utility

In the long-term, the ability of several alternatives to maintain habitats adequate to sustain well distributed viable wildlife populations Forest-wide is a concern, as suggested by the ratings from six wildlife species panel assessments. (As noted in Chapter 3, however, these ratings embody uncertainty about wildlife and habitat interactions, and are much better used for alternative comparisons than actual - or quantifiable - measures of risk.) The alternatives tended to cluster in groups, with Alternatives 1, 4 and 5 generally having the least risk to viability, and Alternatives 2, 7 and 9 the greatest risk. In terms of relative likelihoods of maintaining conditions in the future that would sustain well distributed viable populations, Alternatives 2, 7 and 9 rated lowest, Alternatives 3, 6 and 8 somewhere in-between, and Alternatives 1, 4 and 5 highest. These relative ratings were fairly consistent between species overall, and the rankings (from low risk to high risk) very similar to those given by the old-growth ecosystem panel, and arrived at in other analyses (see both the Biodiversity and Wildlife environmental consequences sections in Chapter 3). Due to existing altered or degraded habitats, and their likely persistence over time, none of the alternatives was considered free from some level of risk.

Fish Habitat

Most alternatives include combinations of three "Riparian Options" designed to minimize to various degrees potential adverse effects to fish habitat. Option 2 incorporates recommendations from the Anadromous Fish Habitat Assessment. Option 1 goes beyond these recommendations (lower risk), and Option 3 reflects the 1991 SDEIS proposals (higher risk). Alternative 3 applies Option 1 (the most protective) to key watersheds, and is the only alternative applying Option 2 to other watersheds. Alternatives 1, 4, 5, 6 and 8 use Option 2 for key watersheds, Option 3 for the rest. Alternatives 2, 7 and 9 use either only Option 3 or only current direction (Alternative 9).

Beyond these riparian-area measures, risks to maintaining high-quality fish habitat come primarily from the amounts and methods of timber harvesting, and the associated amount of new roads constructed. These and other factors were considered by the Fish/Riparian panel. Their overall ranking of alternatives in terms of relative long-term risk to fish habitats Forest-wide, from lowest risk to highest, was: Alternatives 1, 5, 4, 3, 6, 8, 2, 9 and 7.

Noticeable short-term effects to fish habitat are most likely to occur in watersheds where past and near-term future activities are concentrated. This occurs most in alternatives with the highest levels of timber harvesting. These same alternatives project the greatest amounts of road construction over the next decade, and entry into more areas with steep slopes. Alternatives 2, 7 and 9 are distinctly higher in these categories, and also have the least-protective riparian measures. They thus have higher short-term potentials to adversely affect fisheries than the other alternatives. Alternative 1 has no additional timber harvesting or roads, and thus a very low risk. Alternatives 3, 4, 5, 6 and 8 all include at least Riparian Option 2 for key watersheds, helping to reduce short-term risks; Alternatives 6 and 8 have more timber harvest and roading and thus the higher risks within this group.

Karst and Caves

All alternatives comply with the Federal Cave Resources Protection Act in protecting designated significant caves. However, the cave resources of the Tongass are a part of an extensive limestone landscape type known as karst, which has complex relationships to water flows and forested lands. Fully protecting the cave resource requires a wider recognition of these karst areas. Special Karst and Caves Forest-wide standards and guidelines are applied in Alternatives 1, 3, 4, 5 and 6, and these alternatives are most likely to protect sensitive karst areas and the cave resource (still largely unexplored). Alternatives 2, 7, 8 and 9 have less protection, and also greater amounts of timber harvesting, and pose a higher risk to karst areas and caves.

Timber Harvest and Alternatives to Clearcutting

Projected timber harvest levels, as inferred from the allowable sale quantities of the alternatives, range from 0 million board feet (MMBF) in Alternative 1 to 689 MMBF in Alternative 7 (these and the following are all average annual amounts for the first decade. See Table 2-5.). This is a considerably wider range than was evaluated in the 1991 SDEIS. The allowable sale quantities (which are not targets, but ceilings and how much timber may be sold) - also a change from 1991 - are divided into two non-interchangeable components (NIC's) based on harvest economics and available technology. The NIC I portion is the amount considered likely to be economically viable over the next decade. It can be compared to the historic average harvest (340 MMBF per year average between 1980 and 1995 approximates NIC I, contrasted to an ASQ of 450 MMBF (net sawlog) for the same period). Alternatives 2, 7 and 9 have a NIC I sale quantity higher than this amount (Table 2-5), and would be most likely to allow the timber industry in Southeast Alaska to operate at or above historic levels. Alternatives 6 and 8 are somewhat below this average, but have sufficient NIC I volumes to meet long-term timber sale contract requirements and supply a viable independent timber sale program. Alternative 3 is marginal in this regard. Alternatives 4 and 5 would probably not provide sufficient volume to meet long-term contract requirements, but could supply a viable independent sale program in the absence of such a contract. Alternative 1 has no timber harvest scheduled.

Three alternative silvicultural systems were available as options for timber harvest in the forest plan alternatives: even-aged management (clearcutting), two-aged management, and uneven-aged management. (See Table 2-1.) Two harvest rotation ages were also available: an average 100-year rotation ("short" rotation), and an average 200-year rotation ("extended" rotation). The combination of even-aged management with 100-year rotations is the practice used currently, and forms the primary harvest system selected for Alternatives 2, 7 and 9. Other combinations would be considered the "alternatives" to clearcutting.

The Timber section of Chapter 3 discusses the pros and cons of the different harvest systems, and describes the reasons for currently and historically using even-aged management, which has been very successful in regrowing forests across the Tongass. For Southeast Alaska there are many unknowns surrounding the silvicultural alternatives to clearcutting and this translates into considerable uncertainty over their long-term success and effectiveness. This is rather a moot point for uneven-aged management, however, since whether given the choice between it and the two-aged method (Alternatives 4, 5 and 6), or relying on it as the only method (Alternative 1), the computer planning model never selects it, uneven-aged management being highly uneconomic to use. Only in Alternatives 2, 7 and 9, which all have substantial amounts of even-aged harvest, is a small amount of uneven-aged harvest scheduled (from areas where even-aged is not allowed).

Two-aged systems are used in Alternatives 3, 4, 5, 6 and 8; in Alternatives 3, 6 and 8 in combination with 100-year rotations, in Alternatives 4 and 5 in combination with 200-year rotations (see also Table 2-1). The differences in acres scheduled for harvest and sale quantities among these combinations can be seen in Table 2-5. Using two-aged rather than even-aged management with a 100-year rotation results in about 20 percent less timber volume scheduled for harvest (comparing Alternatives 2 and 6 and adjusting for the difference in suitable timber lands available). Using a 200-year rotation instead of 100 years, with all else being equal (comparing Alternative 5 and 6), results in a drop of over 60 percent in harvest volume. Besides the reduced timber volumes from two-aged harvest, the ultimate success of this method is not assured, nor have the anticipated benefits to wildlife and diversity been tested. The use of this method instead of clearcutting did not appear to influence the wildlife-related panel assessment ratings.

Socio-economic Considerations

The analysis of social and economic effects includes an examination of regional (Southeast Alaska) industry and employment impacts, and a more qualitative look at potential effects to each of Southeast Alaska's 30+ communities (including effects on the availability of subsistence resources). The regional analysis concluded that only two employment sectors - timber and recreation/tourism - would show direct or indirect effects from Tongass management over the next decade. There is a fairly direct, linear relationship between the allowable sale quantity of an alternative and the timber jobs that would result from the harvest of that quantity - down to a certain point. For alternatives with sale quantities - either ASQ or the NIC I portion of ASQ (these terms are explained earlier in this chapter) - insufficient to keep a known mill operation in business, offering sales below that amount would not necessarily provide employment. For example, neither Alternatives 4 or 5 are projected to have sufficient volumes to supply the Ketchikan Pulp Company pulpmill at historic reported consumption levels. Alternatives 7, 9 and 2 all have allowable sale quantities adequate to support an increase in Tongass timber-related employment over the next decade. Alternatives 6 and 8 show a slight decrease, and the other alternatives progressively more of a decrease (Alternative 3, followed by 4 and 5, followed by 1).

Employment in the recreation and tourism sectors (considered together in the analysis) increases moderately, and about the same amount, under all alternatives during the first decade.

Recreation and Tourism

Table 2-5 displays first-decade annual recreation visitor day capacity under the alternatives. The differences result from changes in recreation opportunity spectrum classes, which will occur slowly over several decades, and thus appear relatively minor for the first decade. The start of a trend towards the more-developed opportunities is noticeable for Alternative 2, 7 and 9. On a longer-term basis, these alternatives (7 and 9 in particular) will result in a greater shift towards the roaded types of opportunities. Alternatives 2, 4 and 8 will have more modest shifts, followed by Alternatives 5, 6, 3 and 1 (the latter with essentially no change from the present).

LUD group allocations (Table 2-4) are another way to generally identify recreation opportunities. Outside of Wilderness (which is the same for all alternatives), "roadless" recreation availability can be equated to acres within the Natural Setting LUD group. Alternative 1 has a considerably larger acreage in this category than the other alternatives (10.9 million). Alternatives 3, 5 and 6 all have over 6 million acres, and Alternatives 2 and 4 have 5.8 million. Alternatives 7, 8 and 9 each have less than 5 million acres, with 7 offering only 3 million. "Roaded" recreation opportunities in the Moderate and Intensive Development groups are offered in the reverse of this order.

For the analysis of recreation and tourism, various types of "recreation places" - areas popular for specific types of recreation and for tourism - have been identified. In most cases, relatively undeveloped or natural settings for these places are preferred. Forest-wide, for all types of recreation places, Alternative 1 has the most acres in Natural Setting LUD's, followed by Alternative 3, then Alternatives 5 and 6, and then 2, 4 and 8, all with fairly comparable recognition of recreation places. Alternatives 7 and 9 have the fewest recreation place acres in natural settings. Tourism recreation places are recognized in generally the same order and relative amount, with the exception that Alternative 8 joins Alternatives 7 and 9 at a level noticeably lower than the other alternatives.

Scenery

Recognition of scenic quality through application of visual quality objectives is indicated Forest-wide in Table 2-5. Outside of Wilderness, the Retention and Partial Retention categories would be considered capable of maintaining natural or natural-appearing scenery. Acres in these combined categories are highest in Alternative 1. Alternatives 3 and 6 have 7 million or more acres, closely followed by Alternatives 2, 4 and 5 (6.7-6.9 million), and Alternative 9 (6.3 million). Alternatives 7 and 8 have considerably fewer acres in retention and partial retention objectives.

A list of "visual priority routes and use areas" has been developed to help recognize the areas most important for scenic values (by being most often seen by recreationists, local residents, tourists and travellers, etc.). Apart from Alternative 1 (which, with no additional timber harvest or road construction, has essentially no future alterations affecting scenic quality), Alternatives 2-6 all include the majority of these routes and areas either in natural setting LUD's, or in the Scenic Viewshed and Modified Landscape LUD's, although portions of some are assigned to Timber Production. Many are included in Alternative 9 in the LUD II and LUD III categories, but many are also allocated to LUD IV. Alternatives 7 and 8 did not allocate LUD's based on these routes or areas, and do not use the Scenic Viewshed LUD.

Chapter 3
Environment and Effects

Chapter 3

Environment and Effects

Introduction

This chapter combines the "Affected Environment" and "Environmental Consequences" discussions required by the National Environmental Policy Act (NEPA) implementing regulations (40 CFR 1500-1508). Since the Revised Supplement is a supplement to the 1991 SDEIS, the discussions of many of the individual resources, in particular their "affected environments," are limited to summaries of more in-depth information in the 1991 document, and updates of that information as needed. However, with the exception of a few correlations made between alternatives in the 1991 SDEIS and the alternatives in this Revised Supplement, the effects analysis has been substantially redone for the Revised Supplement. The focus is on resources related to the five Revised Supplement issues, but all 1991 SDEIS resources are included. The overall arrangement is similar to the 1991 SDEIS.

The 1991 SDEIS provides an overview of the physical, biological, and socio-economic settings of the Tongass. A brief general description of the Tongass is included in Chapter 1 of the Proposed Revised Forest Plan.

Analyzing Effects

The 1991 SDEIS discusses in detail the general concepts used in analyzing effects, including the key NEPA terms. All significant or potentially significant effects, including direct, indirect and cumulative effects, are disclosed. Many adverse effects can be reduced or mitigated by limiting the extent or duration of effects. Mitigation measures within standards and guidelines are specified for project activities to be implemented under the Revised Forest Plan. These are discussed throughout the chapter, and in detail in the Proposed Revised Forest Plan. Short-term uses (effects) are those that occur annually or within the first ten years of Forest Plan implementation. Long-term productivity refers to the capability of the land and resources to continue producing goods and services for 50 years and beyond. Long-term and cumulative effects are often projected out 100-years or more as needed to fully analyze the potential consequences for particular resources.

For estimating the effects of alternatives at the programmatic Forest Plan level, the assumption is made that the kinds of resource management activities allowed under the LUD's will in fact occur to the extent necessary to achieve the goals and objectives of each alternative. However, the actual location, design and extent of such activities is not known at this time; that is a project-by-project decision. Thus, in many cases the discussions refer to the potential for effects to occur, realizing that in many cases these are only estimates. The effects analysis is useful in comparing and evaluating alternatives, but should not be applied per se to any specific location within the Forest.

In analyzing and evaluating the potential effects from timber harvest activities, keep in mind that the LUD's allowing different levels of timber harvest apply to broad land areas. These areas typically include both suitable and unsuitable timber lands. Within any given area allocated to one of these LUD's, the actual acres harvested will be less than the total acres. Each alternative map in the map packet displays the available lands within the land use designations where timber harvest may occur. Which suitable acres are harvested is once again a project-level decision.

Chapter 1 discussed the reasons for preparing this Revised Supplement, and the development of the Revised Supplement issues. Two facets of this process have been instrumental in providing new information for use in analyzing the environmental consequences of the alternatives. The first was the preparation of a number of science assessments and resource analyses, many of them summarized and referenced throughout the Chapter 3 discussions. These provided information for evaluating aspects of fish, karst and caves, timber, soils, wetlands (discussed under Water), old-growth forests (discussed under Biodiversity), wildlife, and the social and economic environments. (All are included in the References section.)

The other facet of the Revised Supplement process particularly important for this chapter was the use of several "panel assessments" to provide independent analyses related to the effects of the alternatives on particular resources or environmental components. Results of these panels are used in the discussions of environmental consequences in the sections on Biodiversity, Fish, Wildlife, and Communities (socio-economic effects and subsistence effects). Details specific to each panel are discussed in these sections, and a more detailed summary of each panel is included in the planning record (see References). A brief discussion of the general panel process (common to most panels) is included here.

Panel Assessment Process

Most panels were designed to provide information on the relative risk that implementation of each alternative would pose to the continued persistence across the landscape of the species or resource in question. The evaluations were not precise analyses of likelihoods of particular conditions, but rather professional judgements made by knowledgeable experts about possible future outcomes. Each panel included several scientists specializing in the species or resource being evaluated, a facilitator, a scribe, a local resource expert, and a silent observer. After presentations of local resource and planning information, panel members individually rated each alternative based on several possible outcomes (these varied by panel, and are described along with the panel results) prior to any discussion. Following these initial evaluations, the panel engaged in facilitated discussions of their ratings. These were intended to clarify the assignment of particular likelihood points, identify differing interpretations of available information, and point out knowledge gaps and how lack of information was handled by the evaluators. There was no attempt to force consensus; however, panelists were free to reassign likelihood points for any alternative based on what they learned from the discussions.

A "likelihood" approach was used for assessing the level of risk. For each alternative, a total of 100 "likelihood points" were assigned across the array of possible outcomes (usually four or five outcomes were available). Assigning all 100 points to a single outcome would express "complete certainty" in that particular outcome. Uncertainty is expressed by spreading points across the outcomes. These outcomes are not probabilities in the classic sense of frequencies; rather, they represent degrees of belief, based on best professional judgement, expressed with a probability-like scale. The outcomes are most appropriately used for comparing the relative degree of risk projected for each alternative, and are not to be considered as a measurement of the absolute level of risk for any alternative.

Land Use Designation Groupings

For many resources, the effects, and the differences in effects by alternative, are best identified through the land use designation allocations. While each LUD has a different purpose and management emphasis, many are similar in the kinds of effects they would potentially create. Based on this concept, and in order to simplify the identification of effects, the land use designations have been grouped into four categories: Wilderness, Natural Setting, Moderate Development, and Intensive Development.

Table 3-1 displays the land use designation groupings. Each alternative map also uses these groupings to show the LUD allocations, and LUD's are color-coded by group. Alternative 9, the current forest plan, uses the existing LUD's, which are different than those of Alternatives 1-8 (as discussed in Chapter 2); however, for comparative purposes, Alternative 9 LUD's I-IV correspond to the four LUD groups as follows: LUD I = Wilderness; LUD II = Natural Setting; LUD III = Modified Development; LUD IV = Intensive Development.

Table 3-1
Land Use Designation Groupings Used to Discuss Effects

Group	Land Use Designation
Wilderness	Wilderness National Monument Wilderness National Monument Nonwilderness
Natural Setting	Research Natural Area Remote Recreation Special Interest Area Old-Growth Forest Enacted Municipal Watersheds LUD II Semi-Remote Recreation Wild Rivers Scenic Rivers Recreation Rivers
Moderate Development	Experimental Forests Scenic Viewshed Modified Landscape
Intensive Development	Timber Production Minerals

Air

Affected Environment

The air quality of the Tongass National Forest is rated as high, based on monitoring (biological monitoring using lichens) and as evaluated by the Alaška Department of Environmental Conservation. The prevalent airflow from the Pacific Ocean, the small amount of industrial development in Southeast Alaska, and the absence of large population centers all contribute to the clean air. Forest activities have historically had little effect on air quality.

The Alaska Department of Environmental Conservation has designated all of Southeast Alaska, except Juneau's Mendenhall Valley, as being in attainment with national ambient air quality standards or as unclassifiable due to lack of monitoring data. Mendenhall Valley is anticipated to attain the standards in the near future.

Environmental Consequences

The expected direct effects on air quality from forest management activities are temporary and limited in nature, resulting from dust and vehicular emmissions from logging operations, public travel on Forest roads, permitted uses such as community incinerators and tour boat operations, mineral development, and smoke from a limited prescribed fire program. No significant adverse effects on air quality are anticipated from these activities under any of the alternatives.

Indirect effects on air quality can result from large cruise ship emissions, and the use of trees harvested from the Tongass National Forest, such as the operation of industrial processing sites (primarily the Ketchikan Pulp Mill) and firewood burning. These indirect effects on air quality can be aesthetically displeasing or have potential health risks to both humans and the forest. The Environmental Protection Agency and the State Department of Environmental Conservation have regulatory responsibility, under the Clean Air Act, for air quality related to these kinds of sources. The enforcement of the applicable regulations by these agencies is anticipated to keep any potential adverse effects within the standards for air quality; therefore, no significant indirect effects from the uses of the Tongass National Forest should occur.

Biodiversity

Affected Environment

The conservation of biological diversity- or "biodiversity" - is of national and global concern. Biodiversity may be defined as the distribution and abundance of all of the plant and animal communities and species within an area, or as the variety of life and associated ecological processes (Keystone 1991). Biological diversity encompasses the variety of life, including the variety of genetic stocks, plant and animal species and subspecies, ecosystems, and the ecological processes through which individual organisms interact with one another and their environments. The National Forest Management Act (NFMA) requires consideration of biological diversity for the area covered by each forest plan.

It is important to remember that biodiversity does not necessarily equate to “diversity” in an absolute sense. Biological diversity is defined and understood in terms of the natural and historical numbers and distributions of plants and animals, habitats and communities. For instance, in an old-growth forest ecosystem, much of the biodiversity is found within stands of old growth: variations in tree heights and species, differences in understory species, the presence of small openings within a stand, etc. This is the natural habitat for many of the animals living there, and defines the biological diversity important for their survival. Creating a greater amount of younger aged stands of trees may increase the absolute diversity of tree stands, but it may reduce the natural diversity of the ecosystem by creating more young stands than naturally or historically occur. It also reduces the amount of diverse, usable habitats for the species conditioned to old-growth forests and the biological diversity inherent in old growth.

The conservation of biological diversity commonly requires a dual strategy addressing both individual species as well as entire ecosystems (Marcot et al. 1994). The traditional species-by-species approach is important for featured or management indicator species, sensitive or rare species, and for recovery of federally-designated threatened or endangered species. Additionally and perhaps more important, a more comprehensive strategy focused on higher levels of biological organization and ecosystems may be necessary to conserve rare or declining habitats such as old-growth forests, plant and animal communities and ecosystems, as well as the entire complement of associated biota and ecological processes (Noss 1991, Scott et al. 1991, Franklin 1993).

For the Tongass, habitat needs for sustaining viable populations of individual species are addressed by guidelines for specific species or species groups. This is the "fine filter" approach to biological conservation, and is discussed in the Fish, Wildlife, and Threatened, Endangered and Sensitive Species, sections of this chapter.

The ecosystem most often affected by resource management of the Tongass is the old-growth forest ecosystem. The biological diversity associated with these forests is only beginning to be recognized and described. For instance, Franklin (1993) estimated that invertebrate biota, creatures essential to ecosystem function through such processes as nitrogen fixation and decomposition, may represent over 90 percent of the species diversity of old-growth forests in the Pacific Northwest. The most conceivable way to address conservation of these and other elements of biodiversity is by using an ecosystem- or landscape-based strategy (see also Noss 1991 and Scott et al. 1991). Thus in this section, the old-growth ecosystem will be the primary focus for the analysis of biological diversity. This constitutes the "coarse filter" approach to biological conservation (Hunter 1991, Wilcove 1993). For the effects analysis presented later, it will be assumed that if a functional and inter-connected old-growth ecosystem is maintained across the Forest, then the closely associated ecological processes will also be maintained.

The 1991 SDEIS discussed biodiversity in terms of nine "elements," including ecological provinces and processes, plant and animal species numbers and distributions, and habitat fragmentation. These elements and the information presented for each are still valid, but a somewhat different organization of that information can be made to better link the concepts of biological diversity with those of ecosystems, and important new information is also available.

The 1991 SDEIS contained a separate Chapter 3 section on the Old-growth Forest resource. Due to the importance of old-growth forests to biological diversity throughout the Tongass National Forest, and as the key indicator - in terms of changes resulting from forest management - for measuring Forest-wide effects to biodiversity, that section has been incorporated here.

Biological diversity within any ecosystem, from a regionally-defined ecosystem such as the Southeast Alaska temperate rain forest down to a watershed, riparian area, or individual stand of trees, can be described in terms of three components: composition, structure, and function. Composition refers to the numbers and types of species, plant communities, and smaller ecosystems within an area. Structure refers to the arrangement of these communities or ecosystems across a landscape, and how they are connected; to variations in tree heights and diameters within a stand or between stands; etc. Function refers to the interactions and influences between plant and animal species within an area - how each species uses its environment - and to natural processes of change or disturbance (wind, aging, etc.). Table 3-2 lists these components and some scales at which they can be decribed. It also places the biological diversity elements used in the 1991 SDEIS within one of these components.

Composition

Worldwide, temperate rain forests once covered an estimated 90 million acres of North America, southern Chile, New Zealand, Tasmania, and along the eastern Black Sea. Approximately 56 percent of this forest biome remains undeveloped today (Hagenstein 1993). The Tongass National Forest contains 14 percent of the world's acreage of temperate rain forest, and 29 percent of the remaining unlogged acreage (Weigand 1990). These figures are the basis of some of the national and international attention that is focused on the Tongass (Kiester and Eckhardt 1994).

The Tongass National Forest is part of the temperate rainforest ecosystem, or "biome," which extends along the Pacific Coast and includes the northern California redwoods to the Sitka spruce of coastal Alaska. The climate is cool and maritime, with abundant winter rainfall and much summer cloudiness and fog. The Tongass is within the spruce-hemlock-cedar temperate rainforest region of the temperate rainforest biome. The climate of Southeast Alaska is significant in forest development, since the year-round precipitation means that regrowth (or "regeneration") is not limited by the availability of moisture. Over 50 vertebrate subspecies are endemic (native) to the temperate rainforest; many animal subspecies in Southeast Alaska are unique to one or more islands, and other more common species exhibit unique island-dependent patterns in distribution.

Table 3-2
Biodiversity components and scales [1] and the 1991 SDEIS biodiversity elements

Component	Scale	Biodiversity "Element" (from 1991 SDEIS)
Composition	Landscape Types	Ecological Provinces
	Communities	Plant Associations and conditions
	Ecosystems	Plant and Vertebrate Species Numbers
	Species	Extinctions, Introductions, Vulnerability
	Population	Species Abundance and Distribution
		Management Indicator Species
Structure	Landscape Patterns	Habitat Fragmentation
	Habitats	
	Genetic	
Function	Landscape Processes and Disturbances	Ecological Processes
	Land Use Trends	
	Interspecific Actions	
	Life Histories	

[1]Based on Noss 1990

The types of plant communities and plant associations in an area are the result of ecological processes. In Southeast Alaska, these processes have created conifer forests which are ecologically unique in North America. These forests have been classified into one ecosystem, Southeast Alaska coastal old growth, and further into 10 forest cover types and 57 plant associations. This coastal old-growth forest ecosystem is discussed following the discussion of biogeographic provinces, incorporating information from the 1991 SDEIS (Chapter 3, "Old-growth Forests"). A finer classification into cover types and plant associations has been done for the Tongass, and will provide important information for project-level planning. A Forest-wide, quantitative inventory at these finer spatial scales is not yet available.

Biogeographic Provinces

The Tongass itself can be subdivided on an ecosystem basis. The broadest division is that of the biogeographic, or ecological, province. These large-scale provinces are characterized by four traits:

1. species composition in each province is more similar than between adjacent provinces,
2. patterns in distribution are similar for many kinds of organisms; for example, fish, amphibians, mammals, birds, and plants,
3. historical events such as glaciation, uplifting of lands, and changes in sea level are important both to the nature of a province and to the barriers that distinguish each province,
4. climatic conditions and physiographic characteristics are generally more similar within provinces.

Twenty-one "ecological provinces" covering the Tongass National Forest have been identified. They are described in some detail in the 1991 SDEIS, and are listed below with summary descriptions. Figure 3-1 shows their location, with the numbers corresponding to this list. From now on, these will be termed "biogeographic provinces" - the term ecological being applicable to many different ecosystem scales.

1. **Yakutat Forelands Province.** A very young, nearly flat landscape with extensive flooding and active isostatic rebound (uplifting of the ground after glaciers recede). Most surfaces vary from 200 to 1,500 years old. Dune formation and succession are ongoing processes due to glacial rebound and wave action. Plant community patterns reflect a diverse mosaic of naturally-occurring older and young forests, shrublands, bogs, and meadows. Sitka spruce, alder, and cottonwood are abundant on well drained, recently deglaciated and active fluvial surfaces.

2. **Yakutat/Glacier Bay Upland Province.** The climate varies from very wet hypermaritime along the coast to very wet maritime inland. Mountains to over 10,000 feet rising abruptly from sea level, extensive active glaciers, and fiords dominate this landscape. Sitka spruce, alder, and cottonwood are abundant at lower elevations; alpine and lichen over rock plant communities dominate the land from 2,000 to over 10,000 feet elevation.

3. **East Chichagof Island Province.** This province is drier and colder than the outer coast of Chichagof Island; the winter snow pack is generally greater. Chichagof Island is deeply dissected into three peninsulas which may be functioning biologically more like separate islands. Vegetation in this province represents a modal condition similar to the Admiralty Island Province.

4. **West Chichagof Island Province.** This province is dominated by a very wet hypermaritime climate and exposure to outer coastal storms. Hundreds of small islands dot the coast. Topography is gentle when compared to the mountains of Baranof Island and the coastline is highly irregular. The Sitka spruce/Pacific reedgrass plant association is abundant along the outermost coastal fringe; otherwise, vegetation is similar to the other northern islands.

5. **East Baranof Island Province.** This province is colder than West Baranof or eastern Chichagof Island. Mountain glaciers occur along the divide between east and west Baranof. Topography is rugged and steep to saltwater, with little flat land. Plant associations on Eastern Baranof are similar to much of the mainland due to the steep topography and cold environment. Spruce, devil's club, salmonberry forest associations are common on avalanche and steep erosional slopes; alpine and rock/lichen plant communities are abundant.

6. **West Baranof Island Province.** This province is similar to the West Chichagof Island province with the exception of southern Baranof where precipitation exceeds 250 inches per year. Topographically, Baranof Island is the most rugged of all the islands in Southeast Alaska. The southern half of this province is highly dissected by steep-sided fiords; the outer coast is dotted with hundreds of small islands. All forest plant associations except those in the Western redcedar series and those found around large mainland rivers occur in this province. Kruzof Island has some unique vegetation communities which have not been classified.

7. **Admiralty Island Province.** This province represents a modal environment, with relatively gentle topography and moderate rainfall. Winter conditions are moderated by the surrounding marine environment. Winds from Chatham and Icy Straits, Lynn Canal, and off the mainland are often severe. All forest plant associations except those in the Western redcedar series, those found around large mainland rivers, and those occurring only on outer coastal areas occur in this province. Forest productivity is high; fresh and saltwater marshes in the numerous bays and inlets, and alpine and bog communities, are abundant.

8. **Lynn Canal Province.** Rain shadows and the dominating influence of the continental climate make this the driest and seasonally warmest province in Southeast Alaska. Precipitation is generally less than 60 inches per year. The topography is rugged and glaciated. The southern portion of the Chilkat Peninsula is more similar to the Eastern Chichagof Island Province. Western and mountain hemlock, and Sitka spruce, plant associations are common. Alpine tundra and extensive rock/lichen communities dominate much of the land from 2,000 to over 8,000 feet.

9. **Northern Coast Range Province.** This province has little maritime influence. Topography is rugged and glaciated. The Taku and Whiting Rivers extend into Canada. Yellow-cedar plant associations occur in this province.

10. **Kupreanof/Mitkof Islands Province.** The climate is cooler and the winter snow pack greater than on the islands to the south. The eastern edge of this province is strongly influenced by wind-born loess (silt) coming from the Stikine River and the mainland. All forest plant associations except those in the Western redcedar series and those occurring only on outer coastal areas occur in this province. This province contains the highest percentage of muskeg wetlands within the Tongass.

11. **Kuiu Island Province.** Kuiu Island is deeply dissected creating several prominent peninsulas. The topography is gentle compared to neighboring Baranof Island or the mainland. The climate is cooler and winter snow pack greater than on islands to the south, yet milder than the mainland or islands nearer the mainland. The western portion of Kuiu Island is subject to severe windstorms from both the ocean and Chatham Strait. Most forested plant associations occur here, but those found in outer coastal environments dominate.

12. **Central Coast Range Province.** This province is warmer than the northern coast range province. The topography is similar, but overall less precipitous. The Stikine River system is located in the center of this province and has a major continental influence, providing a migration corridor for plant and animal species. Plant associations found along saltwater are similar to those occurring elsewhere in northern Southeast Alaska except for those near the mouth of the Stikine River. Here, unique plant associations subject to high loess-carrying winds can be found.

13. **Etolin Island and Vicinity Province.** Similar to the Kupreanof/Mitkof Islands Province, this province is also subject to continental influence from the mainland and the Stikine River. Glacial flour is present in the marine environment in the northern part of this province nearly year round. All forest plant associations except those occurring only on outer coast areas are present.

14. **North Central Prince of Wales Island Province.** Topography is relatively gentle; limestone is common; and precipitation is relatively low due to interception by lands to the south and southwest. All forest plant associations except those found around the mainland river systems occur in this province; overall forest productivity is high. Karst topography and numerous caves are present.

15. **Revilla Island/Cleveland Peninsula Province.** Climate is variable with warm and wet conditions predominating on land nearest the outer coast, much colder conditions near the mainland. Revilla, Gravina, and Annette Islands are influenced by human activities and populations, whereas the Cleveland Peninsula and Duke Island are generally in a natural condition. Revilla Island has many exceptional estuaries, and muskeg ponds are common on Duke Island, attracting many wintering and migratory birds.

16. **Southern Outer Islands Province.** These islands are isolated and are subject to strong oceanic influences. Temperatures are moderate year round; the topography is low-lying and gentle. These islands are relatively rich in endemic vetebrate, including dusky shrew, long-tailed vole, and ermine. Major coastal seabird colonies are present.

17. **Dall Island and Vicinity Province.** These islands are subject to strong oceanic influences. Temperatures are moderate year around; the topography is rugged and dissected, with abundant limestone outcrops. Dall Island appears to be a glacial refugia but inventories of plants and animals are limited. Major coastal seabird colonies are present on Dall Island.

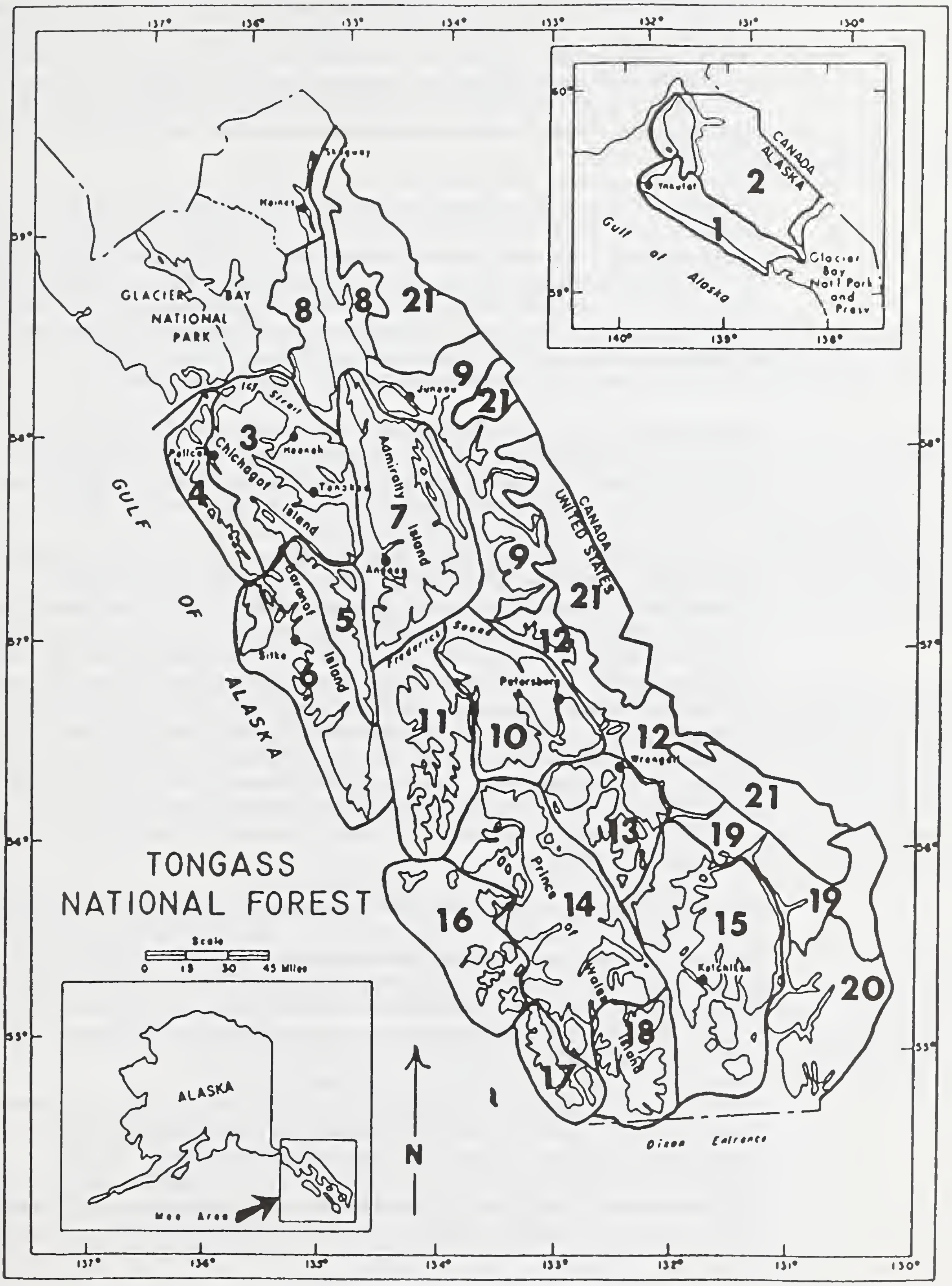
18. **South Prince of Wales Island Province.** The climate is warm and wet; deep snow is rare, or highly transient. The topography is steep and rugged and the coastline is highly dissected. The vegetation in this province is strongly influenced by southeasterly storms; mixed conifer and western hemlock-redcedar plant associations dominate.

19. **North Misty Fiords Province.** This province has considerable topographic relief, and compared to South Misty Fiords a colder, mainland-type climate with many glaciers. Vegetation occurs in long, narrow strips along the valleys and lower slopes of fiords. Much of the vegetation is muskeg, with cottonwoods in some of the river bottoms and subalpine fir along the Canadian border.

20. **South Misty Fiords Province.** South Misty Fiords is typical of the other mainland provinces, and the warmest. Topographic relief is lower in comparison with North Misty. Forest plant associations are more diverse than the other coastal provinces, and the vegetation is less fragmented by rock and ice than in North Misty Fiords. The southwestern portion of this province is rolling, nearly continuous muskeg with conifer forests in the bottoms and flats. This province is the northern limit of Pacific silver fir, yew, and honeysuckle.

21. **Ice Fields Province.** Permanent icefields, active glaciers (some advancing and some receding), and nunataks (mountain peaks between glaciers) dominate this province.

Figure 3-1
Biogeographic Provinces of Southeast Alaska



Old-growth Forest

Old-growth forests are ecosystems distinguished by old and large trees and related structural attributes. Old growth encompasses the later stages of stand development, which typically differ from earlier stages in a variety of ways: larger tree sizes, and more variation in size and spacing; large dead standing or fallen trees; broken or deformed tops, bole and root decay; multiple canopy layers; and canopy gaps and understory patchiness. The rates of change in composition and structure are slow compared to younger forests. Different stages or classes of old growth are recognizable in many forest types.

The old-growth forests of the Tongass are distinctively heterogeneous. At the landscape scale, the diversity of landforms and drainage patterns influences vegetative cover: peatlands (or muskeg) are characteristic of poorly-drained soils, conifer forests of well-drained soils, and sparse "scrub" forest of intermediate areas. At a smaller scale, however, similar vegetative patterns are common, with small patches of poorly-drained, non-forested areas found within old-growth forest, for instance, or a large stand of trees on riparian soils within a larger area of peatland. These and other kinds of heterogeneity are important features of old-growth forest habitat diversity.

Sporadic, low- to moderate-severity disturbances are an integral part of the internal dynamics of old-growth forests. Wind is the most common disturbance element in Southeast Alaska, and canopy openings resulting from the death of overstory trees often give rise to patches of small trees, shrubs, and herbs in the understory.

There are a number of ways to characterize the old growth resource of the Tongass. The 1991 SDEIS includes Forest-wide information on size and strata classes, old-growth plant association series and types, and productivity. In a very general way old-growth forests can be divided into a productive and an unproductive component, based on the ability of specific areas to grow trees of a certain size (sometimes called "commercial timber"). Productive old growth shares many values: for wood products, as important wildlife habitat, for scenic quality and recreation settings, and to maintain water quality and fish habitat. The Tongass contains approximately 8.68 million acres of old-growth conifer forests (as of 1992), of which 5.09 million are productive and 3.59 million acres are unproductive. There are also 8,868 acres of non-conifer (cottonwood) old-growth forest. Old-growth conifer forest types include hemlock (western and mountain hemlock), spruce, hemlock/spruce, and cedar (cedar/hemlock stands are included in the hemlock type).

Estimates of the amount and distribution of the old-growth forests of the Tongass are based on timber inventory information. The timber inventory used 150 years as a breakpoint age for separating young growth from old growth; over 95 percent of the trees sampled in uncut timber stands were greater than 150 years. Most of these stands were well beyond 150 years and were also classed as uneven-aged stands. The development of old-growth characteristics begins at approximately 250 years. There is no timber inventory age category for trees greater than 300 years.

The then-current timber inventory was used in the 1991 SDEIS to divide productive old-growth forest into four volume classes (also called strata classes). Recent examination of the timber inventory has questioned the accuracy of this fine a breakdown, and the strata classes have been re-defined. Statistical analysis indicates that three classes of productive old-growth forest can be distinguished using the existing timber inventory with additional information on soils and slope - the relative measure still being the size and number of trees an area is able to grow (usually expressed as timber volume). Soils are divided into two groups, hydric and non-hydric. The soils inventory consists of "soil mapping units," with hydric soils being those units containing greater than 50 percent wetland soils. The three classes of productive old growth are:

Higher Volumes. Areas within timber inventory volume classes 5, 6 and 7 on non-hydric soils, and on hydric soils with slopes greater than 55 percent.

Middle Volumes. Areas within timber inventory volume classes 5, 6 and 7 on hydric soils with slopes less than or equal to 55 percent; and areas within timber inventory volume class 4 that are either on non-hydric soils, or are on hydric soils with slopes greater than 55 percent.

Lower Volumes. Areas within timber inventory volume class 4 on hydric soils with slopes less than or equal to 55 percent.

Some general characteristics of these three productive old-growth classes, and of "unproductive" or other old-growth forest, follow. All classes of productive old growth are capable of growing trees at a rate of more than 20 cubic feet per acre per year.

Higher Volume Old-growth Forest. These areas have an average timber volume of 35 thousand board feet (MBF) per acre. The average height of co-dominant trees is greater than 100 feet. Canopy cover is 65-95 percent, with western hemlock and/or Sitka spruce dominating most sites. Stands are typically uneven-aged with small gaps in the overhead canopy. Understory production is moderate, but snow interception is high, making forage (for deer) more readily available during winter. Vaccinium is the dominant shrub; herb cover is 20-30 percent, and fern cover is 15-30 percent. Winter thermal cover for wildlife is good. The Tongass has about 2.2 million acres in this class.

Middle Volume Old-growth Forest. In these areas the average volume is 25 MBF per acre. Compared to the higher volume class, these stands have shorter trees (70-100 feet) and a more open canopy (40-75 percent). Western hemlock and/or Sitka spruce still dominate, but cedars can be a significant component in more southerly areas, and mountain hemlock at higher elevations. The stands are uneven-aged, with numerous gaps in the overhead canopy. The more open canopy results in a more abundant understory, but it is subject to burial by snow in the winter. Vaccinium is more abundant on these sites. Ferns are less common, forbs generaly more so. Winter thermal cover for wildlife is moderate. The Tongass has about 2.2 million acres in this class.

Lower Volume Old-growth Forest. The average volume is 16 MBF per acre. The overstory is relatively open, with 20-50 percent canopy closure, and tree height is typically less than 60 feet. Western hemlock and cedars predominate. The understory is very brushy, dominated by tall thickets of Vaccinium and Menzesia which tend to dimimish the production of herbs, ferns, half-shrubs and forbs. Lichens are relatively abundant. Thermal cover for wildlife is poor. The Tongass has about 0.6 million acres in this class.

Other Forest Lands. These are classified as unproductive forest in the timber inventory. These lands have at least 10 percent tree cover, but are not capable of producing 20 cubic feet per acre per year. Many of these stands are consistent with old-growth definitions, but the trees are typically small and stunted (under 40 feet in height) and the canopy is open (10-40 percent cover). Hemlock, cedar, and lodgepole pine are the most common trees; Vaccinium and Menzesia the most common shrubs. Near wet bogs, or muskegs, heath family plants and grasses assume increasing dominance. Thermal cover for wildlife is poor. The Tongass has about 3.6 million acres in this class.

The old-growth forest resource can also be characterized by landscape "position," or the location of the old growth within a landscape. These are also important compositional components for biodiversity. The 1991 SDEIS identified five landscape positions, which are described below. For "beach and estuary fringe," and "riparian," these are areas adjacent to beaches and estuaries, or along a stream or lake. The widths used are general approximations of the average extent of these areas, and include management considerations as well as ecological criteria.

Beach and Estuary Fringe. Old-growth forest within approximately 1,000 feet of the shoreline around estuaries, and approximately 500 to 1,000 feet (this is a change from the SDEIS, which stopped at 500 feet) of the shoreline along the remaining non-estuarine shoreline.

Riparian. A minimum 100-foot-wide zone along both sides of all inventoried streams, excluding the beach fringe. Some stream channel types have a 150-foot-wide zone along both sides, and some zones may extend farther depending on the width of the riparian soils.

Upland less than 800 feet in elevation. All upland old growth below 800 feet, excluding the beach and estuary fringe and riparian zones.

Upland from 800 to 1,500 feet in elevation. All upland old growth between 800 and 1,500 feet, excluding the beach and estuary fringe and riparian zones.

Subalpine/Alpine. All upland old growth over 1,500 feet in elevation, excluding the beach and estuary fringe and riparian zones.

As of 1992, the acreages of the productive and unproductive components of old growth were divided between these five landscape positions as shown in Table 3-3. Note how the percentage of the productive old-growth forest component is higher at the lower elevations, especially in the beach and estuary fringe where it is 83 percent, and in riparian areas, where it is 70 percent. Forest-wide, productive old growth is 59 percent of total old growth.

Table 3-3
Conifer old-growth acres of the Tongass within five landscape positions

Landscape Position[1]	Productive OG	Unproductive OG	Total OG
Beach/Estuary Fringe	499,086	103,273	602,359
Riparian Corridor	463,469	194,879	658,348
<800 ft	2,197,591	1,386,472	3,584,063
800-1,500 ft	1,387,327	807,979	2,195,306
>1,500 ft	537,579	1,096,434	1,634,013
Total	**5,085,052**	**3,589,037**	**8,674,089**

(1) See text for definitions. For this table the beach fringe is an average of 500 feet in width.

Two of the above landscape elements, beach and estuary fringe, and riparian, have special importance as components of old-growth forests, providing unique wildlife habitats, serving as wildlife travel corridors, and providing a forest interface with marine or riverine influences that may distinguish them as separate ecosystems within the larger old-growth forest ecosystem. Riparian areas (also discussed under Fish and Water) are important for fisheries in providing the source of large woody debris that creates pools for rearing habitat, and in controlling stream temperatures and the amount of sediment reaching a stream. Riparian areas provide habitat for terrestrial species associated with aquatic environments (amphibians, for instance, or mammals such as river otter and beaver), and for terrestrial species for which fish from streams are important food (brown and black bears). Riparian areas often contain plant species which can live only where water is available year-round. Riparian soils often support large spruce trees and some of the most highly-productive stands of old growth.

The beach fringe, the strip of vegetation adjacent to salt-water shorelines, is thought to be important as a wildlife travel corridor, as a transition zone between interior forest and salt water influences, and as a unique habitat (or micro-climate) in itself. The beach fringe provides important horizontal or low-elevation connectivity between watersheds, many of which otherwise have very steep sides and/or non-forested ridgetops. In conjunction with riparian areas, which provide connectivity within watersheds, the beach fringe is a component of the major travel corridor system used by many resident wildlife species. The beach fringe is also thought to provide important avian migratory habitat, particularly for neo-tropical migrants.

Protection of the long-term integrity of the beach fringe habitat is a management concern that is addressed by the proposed Beach and Estuary Fringe Forest-wide Standard and Guideline. The primary beach fringe is the first 500' inland from the shoreline. The extended beach fringe is an additional 500 feet extending to 1000' inland from the shoreline. The management objective is to maintain the structural and functional integrity of the beach fringe zone to sustain the multiple use values.

Habitat capability models developed for management indicator species indicate that the highest habitat suitability value was assigned to productive old growth forests within the 500' beach fringe zone for the bald eagle, marten, and river otter (Suring 1993). The beach fringe was rated second only to the 1000' estuary fringe for brown and black bears in overall habitat quality, and higher deer habitat values generally occur in high-volume old growth below 800' elevation, much of which occurs in the beach zone with a moderated maritime-influenced microclimate. A revised marten habitat capability model rated the beach fringe old growth forests highest among all habitat components (Flynn, 1995).

There are indications that the value of the beach zone habitat may extend beyond 500'. Lande (1994) specifically recommended 1000' wide no-harvest corridors with an additional 1000' buffer of light intensity management. Gende et al. (1996) reported reduced bald eagle nesting densities and success in landscapes adjacent to clearcuts and recommended a beach buffer zone of at least 1000'. The 1000' beach fringe is also used very frequently by radio-marked goshawks (Titus, ADF&G unpubl. Data). Finally, the importance of a wider beach fringe zone has long been recognized and is a component of the Retention Factor Method (TLMP 1979 as amended); specifically, 1000' beach fringe for brown/black bear, 600' for furbearers, and 1/4 mile inland from the beach for deer winter range.

An extended beach fringe would serve many functions: providing more effective landscape linkages between habitat reserves, protecting long-term bald eagle habitat capability, buffering the primary beach fringe zone from windthrow (Hodges 1982, Harris 1989), maintaining a functional interior forest condition within the entire primary beach fringe (Concannon 1995), sustaining habitat for goshawks, and indirectly contributing to overall landscape management of lands between habitat reserves.

Table 3-4 displays the total, and current productive old-growth forest, acres within each of the 21 biogeographic provinces. It also shows, as a percentage of the original (1954) amount, how much of the productive old growth was harvested for timber products between 1954 and 1995 (on National Forest lands). About 406,000 of the 1954 estimated amount of 5,440,000 acres of productive old growth have been harvested since 1954 (about 7 percent of the total).

Across the Tongass, timber harvest has been concentrated in the higher volume classes (harvested stands have averaged 39,000 board feet per acre). In contrast to the approximately 93 percent of productive old growth remaining, a smaller percentage, about 83 percent, of the higher volume acres remains unharvested. To a lesser extent, timber harvest has also been concentrated at the lower elevations: 79 percent of the higher volume old-growth timber lands below 800' in elevation remain. Timber harvest has occurred in a spatially clumped fashion across the Tongass, with activity concentrated on islands like Prince of Wales, Northeast Chichagof, and Zarembo. Very little activity has occurred on islands and parts of the mainland within the 19 Wildernesses and 12 legislated LUD II areas.

Fourteen of the 21 biogeographic provinces currently have more than 50 percent of their area in old-growth forest, and for all but two of these the productive old-growth forest component accounts for the majority of the old growth. Sixteen provinces each currently have over 100,000 acres of productive old growth, and three (Admiralty, North Prince of Wales, and Revilla/Cleveland) each have over 500,000 acres. Six provinces: East Chichagof, East Baranof, Kupreanof/Mitkof, Etolin, North Prince of Wales, and Southern Outer Islands, have had ten percent or more of their original (1954) productive old growth harvested (i.e., it is no longer old growth); of these, North Prince of Wales is considerably higher at 32 percent. In some cases this harvest is a relatively small percentage of total province acres (for instance, the roughly 14,000 acres harvested in East Baranof are about 4 percent of that province's 393,000 acres); in some cases (Etolin Island and Vicinity, and Southern Outer Islands) it is approaching 10 percent; and

Table 3-4
Existing conifer old growth in the 21 biogeographic provinces

	Total Acres in Province	Productive Old Growth	Percent OG Harvested[1]
1 Yakutat Forelands.[2]	307,176	48,019	6%
2 Yakutat Uplands.[2]	918,262	24,175	4%
3 East Chichagof Island	1,064,345	411,295	11%
4 West Chichagof Island	285,236	72,194	0%
5 East Baranof Island	392,939	95,966	12%
6 West Baranof Island	775,236	217,555	7%
7 Admiralty Island	1,050,824	590,867	0%
8 Lynn Canal	651,132	158,277	2%
9 North Coast Range	1,014,594	324,562	0%
10 Kupreanof/Mitkof Islands	761,909	314,446	10%
11 Kuiu Island	493,424	303,132	9%
12 Central Coast Range	729,457	244,926	2%
13 Etolin Island	502,928	228,236	15%
14 North Central Prince of Wales Island	1,229,353	535,291	32%
15 Revilla Island/ Cleveland Peninsula.	1,174,490	526,226	6%
16 Southern Outer Islands	215,277	116,271	14%
17 Dall Island & Vicinity	115,886	68,606	1%
18 South Prince of Wales Island	364,543	165,025	1%
19 North Misty Fiords	974,054	199,985	1%
20 South Misty Fiords	906,203	312,844	0%
21 Ice Fields[2]	3,006,074	115,202	4%

Source: Revision data base, Qprov1, March 1996
(1) Percentage of the original (1954) productive old growth harvested between 1954 and 1995.
(2) For these provinces the oldest tree stands are used; they may not contain all of the characteristics associated with old-growth stands in other provinces.

in one case, North Central Prince of Wales, harvest (through 1995) is 14 percent of total province acres. These and other simple ways of characterizing the current condition of the biogeographic provinces can serve as baselines for estimated future changes under the Forest Plan alternatives.

Another way to characterize the old-growth resource is by "blocks" of old-growth forest: relatively contiguous areas of old growth meeting certain criteria. A recent inventory of productive old-growth blocks provides this information (Productive Old-growth Forest Block Inventory, June 1995). Blocks, or concentrations, of productive old-growth forest are important as habitat for many wildlife species, as representations of the old-growth ecosystem, and in general for biological diversity. The old-growth block inventory provides information for the wildlife viability strategies discussed in the Wildlife section.

The recent inventory rated old-growth blocks based on ecological criteria. Size was the key factor; other criteria were landscape diversity, connectivity (such as larger blocks connected by smaller blocks), unique habitats (for instance, riparian areas or beach fringe), and landscape representation (using the biogeographic provinces). Four old-growth block categories were identified:

Category 1. These are the largest, from 10,000 to 100,000 acres. At least one is identified for each of the biogeographic provinces or large islands. These provide ecological stability and representation of the major ecological types.

Category 2. These range in size from 1,000 to 10,000 acres. They provide connectivity between the larger blocks, and representation of finer-scale ecological types.

Category 3. Blocks less than 1,000 acres that contain unique habitats or other features of relatively high ecological value.

Category 4. All other concentrations of old growth less than 1,000 acres in size.

The old-growth blocks were designed so that ecological values would be enhanced wherever possible. Design criteria included shape (a "blocky" shape being preferred to a linear shape to maximize interior old growth), elevational range covered, and proximity to diverse old-growth habitats (such as estuaries and large riparian systems). For the present inventory, only the Category 1 and 2 blocks were mapped. A future step will be to refine the mapping at the watershed scale to better integrate terrestrial and aquatic landscape components. The old-growth block inventory is a useful way to describe and delineate the remaining productive old-growth forests of the Tongass. It can be said to indicate the "population" of old-growth blocks from which the components of a reserve or conservation strategy could be selected - whether that strategy was to maintain habitat for wildlife viability (again, see the Wildlife section), or to maintain the old-growth ecosystem in and of itself.

The remaining aspects of the compositional component of biodiversity are described in the 1991 SDEIS, and elsewhere in this Revised Supplement. These include the abundance and distribution of animal and plant species, the management indicator species, and species vulnerability. See in particular the sections on Threatened, Endangered, and Sensitive Species; and Wildlife (including the viability and species-specific discussions).

Structure

Structure, at the landscape scale, refers to how many of the compositional elements just discussed are distributed across the landscape or forest. Some of these distributional aspects have been discussed or suggested, such as the relationship between elevation and productive vs. non-productive old-growth forests. Beyond that, distribution is difficult to describe narratively: the "Land and Timber Type" map in the map packet, and the map of the old-growth block inventory, give a better picture. In relation to wildlife habitats, distribution is a key element of the viability analyses for wildlife and fish.

Fragmentation

Fragmentation is an element of biological diversity that describes the natural condition of habitats in terms of old-growth patch size and distribution, and the effects of management on these natural conditions. The 1991 SDEIS discusses how wildlife species use or respond to their environment with regard to habitat fragmentation (see also the Wildlife section herein).

Timber harvest tends to increase forest fragmentation and the amount of forest edge. The Tongass National Forest is naturally highly fragmented at the landscape scale due to the numerous islands and dramatic topographic relief. At the stand scale, the forest is also highly fragemented due to a diverse and fine-scale mosaic of forest and land types. The edges between different forest types, and between forested and non-forested areas, can affect the environment close to the edge. For example, forest edges tend to be warmer in the summer and cooler in the winter than interior forests (Franklin 1993). Some species increase in abundance close to an edge while others decrease in abundance. Species associated with interior forests but not with forest edges are of concern since timber harvest tends to decrease the amount of interior forest.

For the Tongass, edge is defined as the forested area within a distance of 2-3 tree lengths (an average of 300 feet) from an opening. This is based primarily on definable differences in micro climate (Concannon 1995). Interior old growth is thus that portion of a contiguous old-growth patch or block more than 300 feet inside the edge or perimeter of the block. Interior old growth tends to have different characteristics than the old-growth forest at the edge of a block, due to light interception by surrounding trees, buffering from the effects of wind, and the general absence of transitional plant species. Interior old growth provides wildlife with habitats protected from predator species that primarily use openings and the adjacent edges of forested areas.

The amount of interior forest depends on the shape of the stands and the abundance of openings. The relative amount of edge and interior forest in an area provides an index to the shape of the old-growth timber stands. The higher the ratio of edge to interior forest, the more linear or dendritic (i.e., branched or fingered in shape) are the stands. (See Table 3-9. It should be noted that the index may over-estimate the effect of edge on interior forest habitat from a micro-climate prespective, since many old-growth timber areas are bordered by other forest types, including "older" young growth, that tends to insulate the interior forest from climate effects.)

Prior to 1950, approximately 2.6 million of the 5.5 million acres of productive old-growth forest were within 300' of a forest edge of one type or another (e.g. beach, muskeg, lake), leaving about 2.9 million acres of interior old-growth forest. Timber harvest over the last 45 years has reduced the amount of interior forest to approximately 2.3 million acres. (It is merely a coincidence that the acreage reduction in interior old-growth is roughly equal to the acres harvested over the same time period. The harvest of blocks of old-growth forest containing interior old-growth will typically reduce the interior at a greater rate than the harvest, since remaining stands that had been interior may no longer be so - the remainder of the block may be too small or too narrow. However, not all past harvesting was done in interior old-growth stands. See Old-growth Assessment Panel Summary, 1996.)

Old-growth patches or fragments sometimes serve as the only habitat in a landscape for many lichens, fungi, bryophytes, plants, and small-bodied animals, all of which contribute to the biodiversity and productivity of the forest ecosystem. Old-growth fragments may be critical for species that are locally endemic, occur only in very specific conditions of forest structure or soil, or have limited dispersal capabilities.

Residual green trees and dead wood in harvested areas function as a bridge between past and future forests. Green trees serve several ecological functions: they are available for snag recruitment, contribute to multi-storied canopies, provide shade and suitable habitat for many organisms, and serve as refugia and centers of dispersal. Patches of green trees of various sizes, ages, and species will promote species diversity of fungi, lichens, plants, and arthropods. Complex canopy structure is beneficial for some lichens, and provides snow interception. Large green trees, snags, and coarse woody debris are important for many animals.

Function

Physical and related ecological processes create the environmental conditions which shape plant and animal communities. Significant natural processes on the Tongass National Forest include:

1. **The amount and pattern of rainfall.** (See Water, and the previous descriptions of the biogeographic provinces.)

2. **The effects of glaciation and time of recession of glaciers.** The distribution and age of the natural vegetational communities is partly the result of glacial advances and recession. The distribution of some animal species among the islands and the mainland is also attributed to the effect of glaciers.

3. **The lack of natural fire.** Fire has not been a major factor in shaping the vegetative conditions of the Tongass.

4. **The influence of wind.** Wind has been a widespread natural disturbance factor, shaping forested vegetation on the Tongass. Wind is a constant "small scale" disturbance force throughout most of the Forest, blowing down individual or small groups of trees and thereby creating small openings in forest stands. Wind can also be a "large scale" disturbance force at specific times and places; large blocks of trees (sometimes hundreds of acres in size) can be blown down in violent localized wind storms. A recent assessment of wind disturbance discusses these natural events in relation to silvicultural methods (Nowacki 1995).

These small-scale and large-scale influences of wind and other disturbance agents (such as landslides, soil slumping, erosion, insects and diseases, and avalanches) directly affect the way forests regenerate. Within-stand disturbances at the small scale are common. These result in "gap phase" regeneration: by creating small gaps in the forest canopy, sunlight is able to penetrate and stimulate new growth (a process called micro-cyclic succession). In the absence of major disturbances, an entire stand will eventually undergo gap phase regeneration, and at any one time will be in multiple stages of succession. Thus, trees of all ages will occur in a shifting but steady-state mosaic, with the death of old trees balanced by the growth of young ones. (This and the following several paragraphs are summarized from "Dynamics of Important Vegetation Communities in Southeast Alaska," Chapter 4 of the Conservation Assessment for Northern Goshawk in Southeast Alaska, July, 1995.)

Large-scale disturbances result in the replacement of an entire stand. Stand development following such disturbance occurs in four stages:

1. **Stand Initiation.** After the disturbance new individuals begin to grow immediately, from sprouting and seeds, and continue to appear for several years. Shrubs, herbs, and conifers grow together for up to 20 years, with hemlock and spruce gradually dominating the overstory. After 25-35 years, this overstory closes in, and nearly all the shrubs and herbs disappear.

2. **Stem Exclusion.** In this stage new individuals or species do not appear, but existing individuals compete for growing space, some growing larger and becoming dominant, others dying. Surviving trees form a closed canopy, light penetration to the forest floor is poor, and the understory lacks vegetative abundance or diversity. This stage can persist for over 100 years.

3. **Understory Reinitiation.** After about 140 to 160 years, as the canopy begins to thin, shade-tolerant shrubs, and eventually evergreen herbs, begin to grow in the understory; conifers also regenerate but grow very slowly. The mature, even-aged forest stand reaches its peak in terms of timber volume, after which tree growth rates decline, tree deaths increase, openings are created, and the overstory becomes vertically stratified (with trees of different heights). However, the all-aged, multi-layered characteristics of old growth have not yet developed.

4. **Old Growth.** Overstory trees begin to die from a number of causes (wind, insects, etc.), and some understory trees begin to reach the overstory. The stand now has a diversity of tree heights, widths, and ages, and a multi-layered canopy with irregular canopy gaps. Large standing and fallen dead trees are present. The understory is diverse in species. The stand age at which these old-growth characteristics predominate varies considerably with local conditions; the minimum age is thought to be 150 to 260 years. Dominant trees in Southeast Alaska old-growth stands generally exceed 250 years in age.

Environmental Consequences

Direct, Indirect, and Cumulative Effects

The previous discussions in this section emphasized old-growth forests as the key to describing and understanding the biological diversity of Southeast Alaska and the Tongass National Forest. These old-growth forests, covering about one-half of the 17-million acres of the Tongass, are the primary habitat for the majority of the terrestrial wildlife species. Thus in discussing the potential consequences to biological diversity of the Forest Plan Revision alternatives, old-growth forests as wildlife habitat, and as an ecosystem with uniquely-defined characteristics, will be the major focus. The Wildlife and Fish sections, including results of several panel assessments, address the habitat aspect (and include considerations of abundance, distribution, vulnerability, and so on). The discussions here will focus on the more general effects to the composition, structure, and functions of the old-growth forest ecosystem, including results of the old-growth ecosystem panel assessment.

There is another major reason for focusing on potential effects to the old-growth resource: the preponderance of changes to the physical and biological environments of the Tongass resulting from all of the Forest Plan alternatives will occur in old-growth forest. The majority of potential alterations to vegetation are a direct result of timber harvest and associated road construction, and under any alternative harvest is limited to old growth for at least another seven or eight decades. While road construction may occur in all vegetation types (see also the sections on Soils and Water), timber harvest is limited to the productive old-growth forest component. In this context it can be said that the old-growth forest ecosystem is the one most “at risk” from continued Tongass National Forest timber management.

Table 3-5 gives a general overview of anticipated changes to the old-growth forest resource over time. This table displays, by Biogeographic Province, the maximum amount of productive old-growth that is estimated to be in a harvested condition after 10 and 100 years under each alternative. This is expressed as a percent of the estimated amount of productive old-growth forest that existed in 1954 (see discussion of Table 3-4 above). Information from this table is used below to evaluate potential short-term effects to biodiversity, and for comparing to panel assessment results (long-term effects) at the end of this environmental consequences sestion.

Short-term Effects. The affected environment discussion noted that the current cumulative amount of timber harvest of productive old-growth forests in the biogeographic provinces, expressed as a percentage of the total productive old growth within the province in 1954, varies considerably. For example, six provinces have had more than 10 percent of their productive old-growth forests logged since 1954, with one (North Central Prince of Wales Island) as high as 32 percent. The amount of the 1954 productive old-growth forest no longer in an old-growth condition can serve as a general indicator of the potential loss of several biodiversity aspects, including structural (within-stand) diversity, connectivity (unfragmented, continuous old-growth blocks), and age and species composition (including understory species). At some point the natural and historical composition and distribution of plant and animal species within an ecosystem or landscape may be altered to the extent that biodiversity (as previously defined) is not likely to be maintained across a biogeographic province, or the Forest. There is no particular number, percent or other measure that identifies this "point."

Table 3-5
Productive old-growth forest planned for harvest by Biogeographic Province by alternative

Biogeographic Province	Current [2] (1995)	Alternatives (1-9) and Percent Cumulative Harvest After Decades 1 and 10																	
		1		2		3		4		5		6		7		8		9	
		1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
1	6	6	6	6	28	6	32	6	12	6	10	6	21	9	34	6	26	6	30
2	4	4	4	4	4	4	4	4	4	4	4	4	4	5	8	4	5	4	8
3	11	11	11	15	42	13	30	12	31	12	29	14	34	16	43	13	31	15	41
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6
5	12	12	12	23	43	18	28	13	31	14	31	15	42	21	52	18	31	23	48
6	7	7	7	12	24	7	11	7	12	7	11	9	18	13	20	8	11	14	29
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	3
8	2	2	2	5	23	4	11	2	9	4	11	4	22	5	35	4	15	5	23
9	0	0	0	3	22	3	15	2	11	2	12	5	20	5	32	3	19	4	28
10	10	10	10	13	44	14	38	12	25	12	25	15	41	14	47	14	39	13	46
11	9	9	9	13	33	11	28	9	26	9	24	12	31	11	42	10	34	14	39
12	2	2	2	6	15	4	13	4	11	4	11	5	15	10	26	7	18	8	20
13	15	15	15	21	41	18	33	16	31	16	32	17	40	27	55	21	44	21	52
14	32	32	32	36	64	35	52	32	50	32	46	34	53	39	74	36	58	38	72
15	6	6	6	11	23	8	18	7	16	7	15	10	23	12	34	9	25	11	26
16	14	14	14	16	26	15	20	14	18	14	21	15	24	17	33	16	23	18	33
17	1	1	1	3	9	1	4	2	5	2	5	3	6	11	50	3	16	11	50
18	1	1	1	7	23	5	14	5	16	5	15	7	23	8	39	6	21	9	33
19	1	1	1	1	2	1	2	1	2	1	2	1	2	2	3	1	3	1	3
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	4	4	4	6	9	4	6	4	6	4	6	4	9	5	10	4	5	5	9

[1] All figures represent the cumulative harvest of productive old-growth forest to the end of the period specified (present cumulative harvest, and at the end of one decade and ten decades of alternative Revised Forest Plan implementation), expressed as a percent of 1954 productive old-growth. (Estimated acreages of old-growth harvest are contained in the Planning Record.)
[2] From Table 3-3.

Table 3-6 includes those biogeographic provinces listed in Table 3-5 which have the highest current percent harvest of productive old growth, and displays what the cumulative percentages would be after one decade. The highest ten provinces are listed, and range in current harvest percent from 32 down to 6 percent; all other provinces have 4 percent or less currently in a harvested condition. The general assumption here is that provinces wth higher curent harvest percentages are more susceptible to significant loses of biodiversity features associated with productive old-growth forests, and that continued harvest within these provinces will increase this susceptibility.

Alternative 1 has no increases. Alternative 7 shows increases in all ten provinces, Alternatives 2, 6, 8 and 9 show increases in nine provinces, and Alternative 3 in eight, thus increasing the potential to adversely affect biodiversity province-wide in the majority of these "higher-risk" biogeographic provinces. Alternatives 7 and 9 generally have the greater increases, followed by Alternatives 2 and 8. Alternatives 4 and 5 have the least effect (after Alternative 1), and are almost identical, with no increase in most provinces. Across the alternatives, provinces 5 (East Baranof) and 13 (Etolin Island and Vicinity) generally show the greatest increases in percents harvested, with province 5 at 13-23 percent and province 13 at 16-27 percent. North Central Prince of Wales remains the most affected on a percentage basis, increasing to 34-39 percent in 6 alternatives.

Table 3-6
Old-growth harvest in selected biogeographic provinces, first decade by alternative (1)

Biogeographic Province	Current Harvest Percent	Percent in Harvested Condition After Decade One Alternative (2)							
		2	3	4	5	6	7	8	9
14	32	36	35	32	32	34	39	36	38
13	15	21	18	16	16	17	27	21	21
16	14	16	15	14	14	15	17	16	18
5	12	23	18	13	14	15	21	18	23
3	11	15	13	12	12	14	16	13	15
10	10	13	14	12	12	15	14	14	13
11	9	13	11	9	9	12	11	10	14
6	7	12	7	7	7	9	13	8	14
15	6	11	8	7	7	10	12	9	11
1	6	6	6	6	6	6	9	6	6

(1) See Table 3-5. All figures are percents of 1954 productive old growth. Provinces are listed in decending order by current harvest percent.
(2) All percents for alternatives represent cumulative old-growth harvest at the end of decade one (2005). Alternative 1 results in no change to the present percentages, and is not included in the column comparisons; however, the "Current Harvest" column can be taken to also represent Alternative 1 at the end of the first decade.

To summarize this brief analysis of potential short-term adverse effects to biodiversity at the biogeographic province level, Alternative 1 has essentially no effect. Alternatives 4 and 5 have relatively minor effects, showing slight increases in potential adverse effects in some provinces and none in others. These two alternatives use uneven-aged management and extended timber rotations, and thus harvest old growth at a slower rate. Alternatives 3, 6 and 8 make up a next category of effects. These three alternatives all have systems of old-growth reserves (Alternatives 3 and 8 Forest-wide; Alternative 6, as Alternative 5, in selected provinces). Alternatives 2, 9 and 7 (roughly in that order) increase the percentages of the existing more-harvested provinces the most. These three alternatives, all of which rely on short timber rotations and even-aged management, and none of which have a designed system of old-growth reserves, have the highest potentials to create biodiversity concerns within biogeographic provinces over the next decade.

Five "landscape positions" were delineated in the affected environment discussions. Two of these, estuaries and the beach fringe, and riparian areas, were noted as having special importance as components of old-growth forests: in providing unique wildlife habitats, for functioning as wildlife travel corridors, and for providing a forest interface with marine or riverine influences. These and other attributes may distinguish these areas as separate ecosystems within the larger old-growth forest ecosystem. For each of the two areas, options are available under the alternatives for applying specific management requirements: three riparian area options under the Riparian Forest-wide standards and guidelines, and two options for beach fringe widths and management under the Beach and Estuary Fringe forest-wide standards and guidelines (discussed in Chapter 2, and included in full in the Proposed Revised Forest Plan).

Riparian options 3, 2 and 1 are progressively more protective of the riparian resource, in that order (see Fish section of this chapter for the analysis of effects to riparian and fish habitats. Effects are not limited to activities such as timber harvest ocurring only within the defined riparian or streamside zone, but can often result from activities within a watershed but outside a defined width.). A less-protective fourth "option" is not to use the Riparian standards and guidelines, but follow all current direction, including Tongass Timber Reform Act buffer requirements. This latter approach is found in Alternative 9. For the other alternatives, Alternatives 1, 4, 5, 6 and 8 use option 2 for the highest quality watersheds, option 3 for the rest. Alternatives 2 and 7 use option 3 for all watersheds. Alternative 3 applies option 1 to the highest quality watersheds, option 2 to the rest.

The Beach and Estuary Fringe standards and guidelines are not used in Alternatives 7 and 9. All other alternatives include a 1,000-foot estuary no-harvest zone, and a 500-foot beach fringe no-harvest zone. (Alternative 9 also provides for protection of estuaries through direction contained in the Alaska Regional Guide.) Additionally, in Alternatives 1, 3, 4, 5, 6 and 8, an additional 500-foot beach fringe zone is included in which only uneven-aged timber harvesting is allowed.

Alternatives 1, 3, 4, 5, 6 and 8 thus provide recognition of both the primary and extended beach fringe, and make this a component of an explicit landscape conservation strategy. In general, these alternatives also have higher relative likelihoods of maintaining viable well-distributed wildlife populations, and sustain greater amounts of deer winter range (see Wildlife section). Only the primary beach fringe is applied in Alternatives 2 and 7, thus providing less protection to the beach zone. Alternative 9 does not apply either the primary or extended beach zone but instead relies on the Retention Factor Method to protect a portion of these areas. Alternatives 2, 7 and 9 generally have the lowest relative likelihoods of maintaining viable wildlife populations, and the absence of either primary or extended beach fringe protection contributes to these lower likelihoods.

Panel Assessment

Information was provided for the old-growth ecosystem panel assessment using a modification of the biogeographic provinces, in order to better delineate individual large islands and contiguous areas with significant amounts of old-growth forest. Tables 3-8 and 3-9 present additional current information on the old-growth forest resource using these modified geographic units. Table 3-7 explains the correlation with the original biogeographic provinces used above, and Figure 3-2 is a map of these areas. Note that while several areas remain the same, a number of provinces are divided into smaller parts, a few are combined, and the Ice Fields province is not included, having less than four percent of its over three million acres in old growth.

Table 3-7
Correlation between biogeographic provinces and panel assessment geographic units

Biogeographic Province	Panel Assessment Area(s)
Yakutat Forelands	combined with Yakutat Uplands
Yakutat Uplands	combined with Yakutat Forelands
East Chichagof	divided into NE Chichagof and Chichagof
West Chichagof	combined with Chichagof portion of East Chichagof
East Baranof	combined with Baranof portion of West Baranof
West Baranof	divided into Baranof and Kruzof Island
Admiralty	Admiralty (no change)
Lynn Canal	divided into East Lynn Canal and West Lynn Canal
North Coast	North Coastal Range (no change)
Kupreanof/Mitkof	divided into Kupreanof Island and Mitkof Island
Kuiu Island	Kuiu Island (no change)
Central Coast	Central Coast Range (no change)
Etolin Island	divided into Etolin, Wrangell, Zarembo Islands
North Prince of Wales	North Prince of Wales (no change)
Revilla/Cleveland	divided into Revilla Island and Cleveland Peninsula
South Outer Islands	South Outer Islands (no change)
Dall Island	Dall Island (no change)
South Prince of Wales	South Prince of Wales (no change)
North Misty	North Misty (no change)
South Misty	South Misty (no change)
Ice Fields	not used (no significant amount of old growth)

The acreages of the 24 panel assessment geographic units are given in Table 3-8. For many of the new units, small islands have not been included in the totals. These and other differences (such as the year used for the existing situation, and different mapping systems) make the numbers given in the following tables and those in Table 3-4 not identical, although comparable. The table also shows for each area the amount of non-National Forest land, total productive old-growth forest, higher-volume old growth, higher-volume old growth under 800 feet in elevation, and other breakdowns.

Figure 3-2
Panel Assessment Geographic Units

Mapscale: 1 inch is equal to 65 miles

Table 3-8
Distribution of Acres of Private, State, and City Lands and Old Growth types by Geographic Unit

Map Code	Geographic Unit	Total Land	Private, City & State Ownership	% Other Owner	Productive Old Growth	Higher Vol. Productive Old Growth	Higher Vol. Productive Old Growth<800'	Young Growth [2]	Other Forest land
ADM	Admiralty Is.	1093168	37480	3	597176	337152	208158	6758	271682
BAR	Baranof Is.	1063615	22797	2	262456	76754	54057	26059	301605
CCR	Central Coast Range	756548	10003	1	244741	105403	65456	7999	179291
CHICH	Chichagof Is.	1143148	32934	3	364957	135153	89441	28337	346811
CPEN	Cleveland Pen.	408541	8709	2	182377	76165	40106	4061	160091
DALL	Dall Is.	180518	82288	46	51228	33221	23303	637	30784
ELYNN	E. Lynn	318142	26800	8	80357	27239	16105	2130	63136
ETO	Etolin Is.	234646	531	0	106393	42393	27525	6714	99770
ISBAR	Kruzof	126421	1356	1	48261	12182	10046	7462	46592
KUIU	Kuiu Is.	506596	741	0	305096	177405	125211	30309	133643
KUP	Kupreanof Is.	652009	13990	2	253035	85771	51748	22220	308324
MIT	Mitkof Is.	139129	15323	11	59885	21943	11631	16048	38766
NCPOW	NC Prince of Wales	1466173	234386	16	508776	220419	134324	189013	417049
NCR	N. Coast Range	1057293	77240	7	314080	127961	62632	2475	168709
NECH	NE Chicagof	275366	36476	13	113713	38361	20460	19999	41049
REV	Revilla Is.	946132	158840	17	336573	182449	93913	32535	319051
SMF	S. Misty Fiords	904444	698	0	311085	111502	73506	1509	372511
SOI	S. Outer Islands	219388	1398	0	117222	53090	38263	18219	71021
SPOW	S. Prince of Wales	418605	53006	13	159435	74440	51908	3302	158124
UNIK	North Misty Fiords	981953	3139	0	198840	68441	39061	5700	287205
WLYNN	W. Lynn	395763	8409	2	91160	40404	23895	4155	65880
WRG	Wrangell Is.	134643	15805	12	56289	21705	11133	7581	51490
YAK	Yakutat	1251423	30346	2	145794	71463	70838	31681	443678
ZAR	Zarembo Is. Area	151651	3	0	72097	24474	14973	22547	53570
	Forest-wide [1]	14825315	872698	6	4981026	2165490	1357693	497450	4429832

[1] Does not include icefield provinces and many small islands.
[2] Includes both natural and post harvest young growth.

Table 3-9 displays changes in old growth within panel assessment geographic units occurring since 1954, expressed as proportions of the estimated 1954 amount. Four categories are included: total productive old growth, interior old growth, higher-volume old growth, and higher-volume old growth under 800' in elevation. These reductions can be compared with the current acreage information in Table 3-8 to give a fuller picture of the state of the old-growth resource by area. (Note that in the tables "forest-wide" refers only to the aggregate of these panel assessment areas, which exclude some large areas with little or no old-growth forests and many small islands, and not to total Tongass acres.)

Table 3-9
Changes in Selected Types of Productive Old-growth Since 1954 by Geographic Unit on National Forest Lands (proportion remaining).

Map Code	Geographic Unit	Productive Old Growth	Interior Productive Old Growth)	Higher Vol Productive Old Growth	Higher Vol Productive Old Growth <800'
ADM	Admiralty Is.	0.99	0.97	0.98	0.97
BAR	Baranof Is.	0.91	0.77	0.75	0.69
CCR	Central Coast Range	0.97	0.95	0.93	0.90
CHICH	Chichagof Is.	0.93	0.82	0.84	0.79
CPEN	Cleveland Pen.	0.98	0.94	0.96	0.94
DALL	Dall Is.	0.99	0.97	0.98	0.97
ELYNN	E. Lynn	0.97	0.96	0.93	0.90
ETO	Etolin Is.	0.94	0.86	0.88	0.86
ISBAR	Kruzof	0.87	0.72	0.63	0.58
KUIU	Kuiu Is.	0.91	0.80	0.86	0.84
KUP	Kupreanof Is.	0.92	0.82	0.81	0.75
MIT	Mitkof Is.	0.79	0.60	0.60	0.53
NCPOW	NC Prince of Wales	0.73	0.51	0.56	0.49
NCR	N. Coast Range	0.99	0.99	0.98	0.97
NECH	NE Chicagof	0.85	0.68	0.70	0.60
REV	Revilla Is.	0.91	0.81	0.86	0.81
SMF	S. Misty Fiords	1.00	0.98	0.99	0.99
SOI	S. Outer Islands	0.87	0.74	0.75	0.72
SPOW	S. Prince of Wales	0.98	0.95	0.96	0.95
UNIK	North Misty Foirds	0.97	0.94	0.93	0.89
WLYNN	W. Lynn	0.96	0.88	0.91	0.86
WRG	Wrangell Is.	0.88	0.75	0.79	0.74
YAK	Yakutat	0.82	0.77	0.69	0.69
ZAR	Zarembo Is. Area	0.76	0.54	0.53	0.46
	Forest-wide [1]	0.91	0.81	0.82	0.78

[1] Does not include ice field provinces and many small islands

Panel Assessment Process

Assessments of the relative likelihood of maintaining a functional and interconneted old-growth ecosystem were performed for nine alternatives by a four-person panel of experts. These assessments focused on the primary producers of the old-growth ecosystem (the vegetation), and the processes and functions (physical, chemical, and biological, including disturbances) associated with the quality and dynamics of those primary producers. The effects of the alternatives on late-successional forest ecosystems were evaluated in terms of degrees (Outcomes 1 through 4) of ecosystem quantity and quality (abundance, diversity, processes, functions, and connectivity).

Information used to assess the effects of the alternatives on old growth included estimates of the abundance of old growth in 1954 and 1995, and estimates of possible changes by the year 2095. Maps were available to the panel displaying the spatial distribution of existing Congressionally designated reserves, old-growth timber lands, other forest lands, and non-federal ownership; and displaying potential areas of timber harvest for each alternative.

The rating of old-growth ecosystems was based on three attributes that characterize the quality and quantity of components of the ecosystem. These attributes correspond to the three components of biodiversity discussed in the affected environment portion of this section: composition, structure, and function. The attributes are:

1. **Abundance and ecological diversity ("composition").** The acreage and variety of plant communities and environments.

2. **Processes and functions ("function").** The ecological actions that lead to the development or maintenance of ecosystems, and the values of the ecosystem for species and populations.

3. **Connectivity ("structure").** The extent to which the landscape pattern of the ecosystem provides for biological flows that sustain animal and plant populations.

Abundance and Ecological Diversity. Abundance of old-growth communities and ecosystems refers to the total acreage of forest that meets structural, functional, or minimum-age criteria, based on ecological conditions and definitions of each province. Ecological diversity is also indicated by the distribution of old-growth communities on the landscape, and the interrelationships among the variety of geographic, climatic, elevational, topographic, and soil distributions.

The four possible outcomes that characterize different levels of abundance and ecological diversity of old-growth forest communities and ecosystems used by the panel are:

> **Outcome #1.** Old growth is equal to or greater than the long-term (100-year) average, and is well distributed across environmental gradients, provinces, and vegetation community types.
>
> **Outcome #2.** Old growth is somewhat less than the long-term average in some provinces and forest types. There is representation of all major forest types but with underrepresentation in some types (may be within range of variability).
>
> **Outcome #3.** Old growth is below the long-term average in most forest types. Examples of a few old-growth types are eliminated.
>
> **Outcome #4.** Old growth is well below the long-term average in all provinces. Examples of several old-growth types eliminated in some provinces.

Process and Function. Processes refer to the ecological changes or actions that lead to the development and maintenance of old-growth ecosystems at all spatial and temporal scales. Examples include: (1) tree establishment, maturation, and death, (2) gap formation and filling, (3) understory development, (4) small- and large-scale disturbances such as landslides and wind, (5) decomposition, (6) nitrogen fixation, (7) canopy interception of energy and matter, and (8) energy and matter transfers between the forest and atmosphere.

Functions, as used in this assessment, refer to ecological values of the late-successional ecosystem or its components that maintain or contribute to the maintenance of populations of species that used these ecosystems, and that contribute to the diversity and productivity of other ecosystems. Examples of ecosystem functions include: (1) habitat for organisms, (2) climatic buffering, (3) soil development, and (4) the maintenance of soil productivity through inputs of coarse woody debris, nitrogen fixation, spread of biotic and abiotic disturbance through landscapes, and nutrient cycles (production, storage, utilization, and decomposition).

The four possible outcomes that characterize different levels of ecological processes, and functions of old-growth forest communities and ecosystems, used by the panel are:

Outcome #1. Full range of disturbance processes. Stand structure/dynamics and landscape/structure/dynamics/age structures occur across all provinces.

Outcome #2. Moderately wide range of disturbance processes. Old-growth process and function for species dependent on large unaltered landscapes are limited. Old-growth process and structure dependent on a wide range of ages is moderately limited.

Outcome #3. Old growth process/structure/function limited in many provinces. Many landscapes and stands too small/young to sustain old growth process/structure/function or stand structure does not develop.

Outcome #4. Old growth process/structure/function is extremely limited or absent in some provinces.

Connectivity. Connectivity is a measure of the extent to which the landscape pattern of the old-growth ecosystem provides for biological and ecological flows to sustain old-growth associated animal and plant species across the Tongass and Southeast Alaska. Connectivity does not necessarily mean that old-growth areas need to be physically joined in space, since many associated animal species can move (or be carried) across areas that are not in old-growth ecosystem conditions. Landscape features affecting connectivity of old-growth ecosystems are: (1) distances between old-growth areas, and (2) forest conditions in the areas between the old-growth areas. Given the island nature of Southeast Alaska, connectivity is more stongly related to within-island conditions than between islands.

The four possible outcomes that characterize different levels of ecological connectivity of old-growth forest communities and ecosystems used for the panel are:

Outcome #1. Connectivity is as strong as prior to large-scale timber harvest.

Outcome #2. Connectivity is strong, characterized by moderate distances between old-growth areas. Timber harvest areas contain high levels of old-growth elements and riparian corridors.

Outcome #3. Connectivity is moderate, characterized by moderately-wide distances between old-growth areas and the elements of old growth in timber harvest areas (retention patches, riparian corridors, etc.).

Outcome #4. Connectivity is weak. Wide distances and limited presence of connectivity elements in timber harvest areas.

To provide a benchmark against which to measure change, old-growth abundance is compared to its abundance in 1954, prior to large scale timber harvest. This abundance varies by province and ownership. For each of the three attribute categories just described, that attribute's set of outcomes (Outcomes I-IV) was applied by the panel using the information in Tables 3-10 and 3-11, and other information as previously discussed. These tables follow.

Overall Old-growth Descriptions. Overall outcomes for the old-growth ecosystem as a whole were obtained by combining the three individual attribute outcomes. The likelihoods of achieving overall outcomes are the averages of the likelihoods of individual attribute outcomes.

Panel Assessment Results and Additional Effects Analysis

Harvest levels used in this assessment for each alternative should be viewed as maximums. It was assumed that all old-growth stands scheduled for harvest by alternative would be harvested by 2095, but actual harvest rates are likely to be less due to timber market cycles, logging economics, resource concerns uncovered during project planning, and errors in inventories. In addition, the alternatives had not been adjusted for implementation factors (see Timber section) at the time the panel assessment meeting was held. Therefore, the numbers presented here should be viewed as the maximum effects that may occur under each alternative, and not as an estimate of actual effects.

The alternatives are estimated to yield from 63 to 90 percent of the 1954 old-growth timber lands abundance levels (Table 3-10). This represents 66 to nearly 100 percent of current levels of old-growth at 2095, depending on the alternative. In addition, 100 percent of the other forest lands will be remaining in all alternatives at 2095. The alternatives are estimated to yield from 57 to 82 percent of the 1954 level of the higher volume old-growth abundance. The degree of change varies by province and ownership, with the least change found within Wilderness and roadless areas and the most change found in provinces that either have large holdings of non-National Forest lands or prior high levels of timber harvest.

Assumptions or opinions held by one or more panel members that are likely to have influenced their ratings included the following:

1. Old-growth reserves by themselves are not adequate. Need more residual trees left in clearcuts such as two-aged management as proposed in Alternatives 3, 4, 5, 6 and 8 to maintain lichens, fungi, and other species. This an important consideration for connectivity, structure, function, and processes.

2. Alternatives with longer rotations were rated higher because more old-growth was left longer.

3. The panel had concerns about the future representation of higher-volume yellow-cedar stands and the higher-volume hemlock stands in areas that did not have reserves.

Table 3-10

Proportion of 1954 Productive Old Growth Remaining at 1995 and 2095 by Alternative

MAP CODE	Geographic Unit	1995	Productive Old Growth in 2095								
			Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
ADM	Admiralty Is.	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.97	0.97	0.95
BAR	Baranof Is.	0.91	0.88	0.72	0.85	0.82	0.82	0.76	0.70	0.83	0.67
CCR	Central Coast Range	0.97	0.97	0.79	0.84	0.86	0.86	0.79	0.64	0.75	0.73
CHICH	Chichagof Is.	0.93	0.93	0.73	0.77	0.81	0.81	0.73	0.70	0.76	0.70
CPEN	Cleveland Pen.	0.98	0.98	0.66	0.80	0.80	0.83	0.74	0.48	0.69	0.60
DALL	Dall Is.	0.99	0.99	0.84	0.93	0.91	0.94	0.90	0.14	0.75	0.15
ELYNN	E. Lynn	0.97	0.97	0.83	0.86	0.89	0.89	0.84	0.76	0.80	0.89
ETO	Etolin Is.	0.94	0.94	0.64	0.74	0.78	0.78	0.67	0.56	0.69	0.57
ISBAR	Kruzof	0.87	0.87	0.66	0.80	0.80	0.80	0.75	0.71	0.78	0.55
KUIU	Kuiu Is.	0.91	0.87	0.64	0.69	0.76	0.76	0.66	0.50	0.62	0.57
KUP	Kupreanof Is.	0.92	0.86	0.53	0.59	0.70	0.71	0.57	0.44	0.55	0.49
MIT	Mitkof Is.	0.79	0.79	0.48	0.54	0.61	0.63	0.53	0.41	0.53	0.41
NCPOW	NC Prince of Wales	0.73	0.71	0.43	0.55	0.57	0.61	0.52	0.34	0.50	0.36
NCR	N. Coast Range	0.99	0.99	0.73	0.80	0.84	0.84	0.75	0.61	0.73	0.66
NECH	NE Chicagof	0.85	0.85	0.39	0.56	0.59	0.66	0.52	0.36	0.56	0.37
REV	Revilla Is.	0.91	0.91	0.70	0.77	079	0.79	0.71	0.59	0.72	0.66
SMF	S. Misty Fiords	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SOI	S. Outer Islands	0.87	0.87	0.73	0.79	0.79	0.79	0.74	0.64	0.76	0.63
SPOW	S. Prince of Wales	0.98	0.98	0.71	0.82	0.73	0.73	0.73	0.51	0.74	0.57
UNIK	North Misty Foirds	0.97	0.97	0.93	0.94	0.95	0.95	0.94	0.92	0.93	0.93
WLYNN	W. Lynn	0.96	0.96	0.63	0.85	0.77	0.77	0.65	0.49	0.77	0.59
WRG	Wrangell Is.	0.88	0.88	0.45	0.56	0.63	0.63	0.47	0.38	0.49	0.44
YAK	Yakutat	0.82	0.82	0.74	0.77	0.78	0.78	0.75	0.73	0.76	0.74
ZAR	Zarembo Is. Area	0.76	0.76	0.38	0.49	0.54	0.54	0.40	0.31	0.45	0.30
	Forest-wide [1]	0.91	0.90	0.70	0.77	0.79	0.80	0.73	0.62	0.73	0.65

[1] Does not include ice field provinces and many small islands

Table 3-11
Proportion of 1954 Higher Volume Productive Old Growth remaining at 1995 and 2095 by Alternative

Map Code	Geographic Unit	1995	Higher-volume Productive Old Growth in 2095 Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
ADM	Admiralty Is.	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.97	0.97	0.96
BAR	Baranof Is.	0.75	0.73	0.62	0.70	0.68	0.68	0.62	0.58	0.70	0.56
CCR	Central Coast Range	0.93	0.93	0.78	0.83	0.84	0.84	0.78	0.62	0.75	0.73
CHICH	Chichagof Is.	0.84	0.84	0.66	0.71	0.74	0.74	0.67	0.62	0.70	0.63
CPEN	Cleveland Pen.	0.96	0.96	0.71	0.82	0.82	0.85	0.77	0.53	0.71	0.67
DALL	Dall Is.	0.98	0.98	0.88	0.95	0.94	0.96	0.94	0.33	0.82	0.35
ELYNN	E. Lynn	0.93	0.93	0.80	0.83	0.86	0.86	0.81	0.74	0.78	0.83
ETO	Etolin Is.	0.88	0.88	0.60	0.71	0.73	0.73	0.63	0.52	0.65	0.53
ISBAR	Kruzof	0.63	0.63	0.47	0.52	0.54	0.54	0.48	0.52	0.57	0.40
KUIU	Kuiu Is.	0.86	0.81	0.60	0.66	0.72	0.72	0.62	0.46	0.58	0.54
KUP	Kupreanof Is.	0.81	0.77	0.44	0.50	0.60	0.62	0.49	0.37	0.47	0.41
MIT	Mitkof Is.	0.60	0.60	0.39	0.43	0.48	0.49	0.42	0.34	0.41	0.33
NCPOW	NC Prince of Wales	0.56	0.54	0.33	0.42	0.44	0.47	0.41	0.26	0.39	0.27
NCR	N. Coast Range	0.98	0.98	0.72	0.80	0.83	0.83	0.73	0.59	0.73	0.65
NECH	NE Chicagof	0.70	0.70	0.33	0.50	0.51	0.56	0.47	0.28	0.49	0.29
REV	Revilla Is.	0.86	0.86	0.68	0.75	0.76	0.76	0.69	0.62	0.72	0.65
SMF	S. Misty Fiords	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
SOI	S. Outer Islands	0.75	0.75	0.60	0.69	0.67	0.67	0.62	0.54	0.66	0.53
SPOW	S. Prince of Wales	0.96	0.96	0.70	0.82	0.81	0.81	0.72	0.56	0.75	0.61
UNIK	North Misty Foirds	0.93	0.93	0.89	0.90	0.91	0.91	0.89	0.88	0.88	0.89
WLYNN	W. Lynn	0.91	0.91	0.54	0.76	0.70	0.70	0.56	0.42	0.70	0.52
WRG	Wrangell Is.	0.79	0.79	0.43	0.53	0.58	0.58	0.44	0.35	0.46	0.41
YAK	Yakutat	0.69	0.69	0.61	0.62	0.64	0.64	0.61	0.59	0.61	0.60
ZAR	Zarembo Is. Area	0.53	0.53	0.28	0.35	0.30	0.30	0.30	0.22	0.31	0.20
	Forest-wide [1]	0.82	0.82	0.65	0.71	0.73	0.73	0.67	0.57	0.67	0.59

[1] Does not include ice field provinces and many small islands.

4. The panel had a concern that there was no longer a representation of the very large riparian spruce stands on the Tongass.

5. The panel did not endorse alternative silviculture as better than reserves and did not have high confidence in either, since these are only working hypotheses.

6. Disease is important in terms of old-growth function, and is a component missing in younger stands. Mistletoe is lost in younger stands. Two-aged management and longer rotations help to conserve these features.

7. In managed landscapes, expect an increase in processes associated with wind disturbances along edges of cutting units and a decrease in wind disturbances within young stands. Two-aged harvesting will allow soil mixing within units, but if the more wind-firm trees are left the rate of stand-level disturbance will be reduced.

8. Large old trees with large root systems will churn more soil than smaller trees. Soil churning may retard the evolution of a productive stand to muskeg.

9. Wider beach fringe and riparian reserves enhance connectivity. They provide vertical and horizontal corridors.

10. Smaller harvest units can lead to more connectivity, but will increase fragmentation.

11. Mitigation measures for connectivity (corridors) are good ideas, but need to be tested to see if they work.

12. May not need 500-year-old trees to maintain connectivity, but the structure they provide is needed.

13. Old-growth "other forest lands" provide corridors for many species.

14. Species appear to be present where there is habitat for them, so isolation and fragmentation may not be a problem for many species. Given the fragmented nature of Southeast Alaska, species that are well adapted to fragmented landscapes (such as those having the ability to disperse) are the ones that tend to be found here.

Panel Results. Average panelist scores for each old-growth assessment element (attribute) are shown in Table 3-12. Even Alternative 1, which has the highest degree of old-growth protection, did not receive the majority of points in Outcome I. This is attributed to past timber harvest levels on non-federal lands (such as on Dall Island), and localized intensive timber harvest on National Forest lands (such as on North Prince of Wales Island).

Alternatives 1, 3, 4, 5 and 6 consistently rated higher than Alternatives 2, 7, 8 and 9. Features of alternatives rating relatively high include: 1) longer rotations, 2) additional old-growth reserves, 3) two-aged timber harvest systems, and 4) expanded beach and riparian areas. Alternatives 1 and 5 had the highest scores.

Alternative 2 (1992 Alternative P) was rated relatively low because it does not include alternative silviculture at the stand level, and does not provide reserves other than existing Congressionally designated areas at the landscape level. Short rotations and standard clearcut harvesting mean a low level of biological legacy within young growth stands and a corresponding decrease in connectivity between reserves. Existing reserves were deemed to be too clumped in distribution and were absent in some areas (such as Zarembo Island). These same considerations hold for Alternatives 7 and 9.

The relatively low likelihood rating for Outcome I for most alternatives reflects, in part, a lack of sufficient or conclusive information about: (1) provinces and functions of late-successional and old-growth ecosystems; (2) the nature, role, and importance of landscape-level ecological processes, including disturbance; (3) the role and relationship of species diversity and ecosystem functions such as productivity, nutrient cycling, and decomposition; and (4) the effects of climate change. In addition, scientific uncertainty led to differences in opinions among panel members about particular outcomes.

Table 3-12
Average Old-growth Ecosystem Panel Ratings [1]

Outcome	Alternative								
	1	2	3	4	5	6	7	8	9
Abundance and Diversity									
I	28	3	13	10	20	14	4	6	0
II	65	25	55	63	61	48	20	46	31
III	8	68	30	23	18	36	55	45	51
IV	0	5	3	6	1	3	21	3	18
Process and Function									
I	65	5	23	31	43	23	0	10	0
II	30	28	35	53	46	49	10	23	15
III	5	50	33	15	10	25	38	40	36
IV	0	18	10	1	1	4	53	23	49
Connectivity									
I	33	1	5	10	20	16	0	0	0
II	63	18	40	55	64	58	5	21	9
III	5	55	49	35	16	23	45	58	46
IV	0	26	6	0	0	4	50	21	45

[1] Averages of the individual panelist's ratings.

Long-term Effects. One way to more easily compare the alternatives based on these sets of ratings is to look at the definitions of each set of outcomes previously described. They are summarized here for convenience:

1. Abundance and Diversity: In Outcomes I and II all major forest types are represented, although with some underrepresentation in Outcome II; whereas in Outcomes III and IV, a minimum of a few types are eliminated.

2. Process and Function: Outcomes I and II have a full range, or moderately wide range, of processes, with some limitations on large unaltered landscapes and age distribution in Outcome II. In Outcome III, processes, structure and function are limited in many provinces and landscapes, and in Outcome IV extremely limited or absent.

3. Connectivity: In Outcomes I and II connectivity remains strong, whereas in Outcome III it is moderate and in Outcome IV weak.

Considering Abundance and Diversity, Alternatives 1, 3, 4 and 5 have the majority of points assigned to Outcome II, and thus provide the highest relative likelihoods of having all forest types represented, though with some under representation. Alternatives 2, 7 and 9 on the other hand have the majority of their points in Outcome III, and provide the highest relative likelihoods that some forest types could be eliminated. Alternatives 6 and 8 fall somewhere in between.

Considering Process and Function, Alternative 1, with the majority of its points in Outcome I, is most likely to maintain a full range of processes over time. Alternatives 4, 5 and 6 have a preponderance of points in Outcomes I and II, with a majority or near majority in Outcome II, indicating a relative likelihood of maintaining a wide range of processes with some limitations. Alternative 3 is noticeably spread out between outcomes, indicating no clear likelihood one way or the other. The other four alternatives (2, 7, 8 and 9) display higher relative likelihoods that processes and functions will be limited (Alternatives 2 and 8) or extremely limited (Alternatives 7 and 9) in the long term.

Finally, considering Connectivity, this attribute is indicated as more likely to remain strong (Outcomes I or II) under Alternatives 1, 4, 5 and 6, moderate to strong (Outcomes II or III) in Alternatives 2, 3, 6 and 8, and weak to moderate (Outcomes III or IV) in Alternatives 7 and 9.

To some extent the three sets of ratings in Table 3-12 are based on similar information and criteria: the total amount of old-growth forest projected to be harvested by alternative; and the specific harvest practices, reserve allocations, and standards and guidelines of each alternative. Although there are differences, there is also considerable overlap between the ratings for the three attributes. This is one reason for the seemingly similar patterns across alternatives for the three sets of ratings, and suggests that averaging the three scores by alternative will give a reasonable summary of the three, and a comparable overall subjective measure of the relative likelihoods of risk to old-growth ecosystems over time. These average scores are displayed in Table 3-13. A ranking of alternatives by using these composite scores can be made, based on the preponderance of points for each alternative. This ranking (lowest relative likelihood of risk to highest) is: Alternatives 1, 5, 4, 6, 3, 8, 2, 9 and 7.

Table 3-13
Old-growth ecosystem: composite panel scores by alternative [1]

	Alternative								
	1	2	3	4	5	6	7	8	9
Old-growth Ecosystem Composite Scores [2]									
Outcome I	42	3	14	17	28	18	1	5	0
Outcome II	53	24	43	57	57	51	12	30	18
Outcome III	6	57	37	24	15	28	46	48	44
Outcome IV	0	16	6	2	1	4	41	16	37

[1] Based on Table 3-12. See text for explanations.
[2] Average of the three corresponding scores in Table 3-12.

Comparing these long-term discussions and rankings with those from the short-term effects discussed earlier, Alternatives 1, 5 and 4, generally in that order, appear at the lesser-adverse-effects end of the spectrum, and Alternatives 7, 9 and 2 (in that order, 7 having the most effects) at the greater-adverse-effects end. Alternatives 1, 4 and 5 are those that rely on uneven-aged management with extended rotations, and have a fairly full complement of wildlife-oriented measures (most of which tend to maintain more old-growth forest habitats and features). Alternatives 7, 9 and 2 all rely on even-aged management with shorter rotations, have fewer wildlife-oriented measures, and provide no designed system of old-growth reserves. Alternative 8, which adds an old-growth reserve system to Alternative 7, was comparable to Alternatives 3 and 6 in terms of short-term potential to create adverse effects, but ranks lower based on long-term likelihood outcomes. Alternatives 3 and 6, which add old-growth reserves either Forest-wide or to selected provinces to Alternative 2, and which have full (though different) compliments of habitat protection measures, generally rank between Alternative 8 and Alternatives 4 and 5.

One other way of portraying long-term effects potential is to extend the biogeographic province analysis done earlier for short-term effects into the long term, using the tenth-decade columns from Table 3-5. These numbers represent the percentages of cumulative productive old-growth harvested within each province through the hypothetical tenth-decade of Forest Plan implementation under each alternative. For comparative purposes, each alternative has been examined for the ten provinces showing the highest cumulative percents, and then ranked by comparing the range of those percents. (For Alternative 1, the current percents were used, since it has no measurable additional effects.) Table 3-14 shows the results. Once again, the rankings are comparable to those previously arrived at.

Table 3-14
Ranking of alternatives based on long-term potential effects to biodiversity at the level of biogeographic provinces [1]

Ranking: Least to Most Reductions in Biodiversity	Alternative	Range of Ten Highest Cumulative Percents
1	1	6-32
2	5	12-46
3	4	12-50
4	3	14-52
5	6	22-53
6	8	21-58
7	2	23-64
8	9	30-72
9	7	34-74

[1] Based on tenth-decade figures from Table 3-5.

Experimental Forests

Affected Environment

Experimental forests provide areas for conducting manipulative research that serves as a basis for forest management. Natural resources in experimental forests are used or altered under controlled scientific studies. The Tongass currently has two experimental forests, Young Bay and Maybeso. These are described in the 1991 SDEIS.

No new experimental forests are being proposed for the Tongass Forest Plan Revision. The Young Bay experimental forest is proposed for de-listing under Alternative 1 due to its limited research opportunities, limited applicability to other areas of the Forest, and proximity to the Young Lake Addition to the Kootznoowoo Wilderness.

Environmental Consequences

The 1991 SDEIS discussed the potential effects of continuing to manage Young Bay and Maybeso as experimental forests, finding them to be negligible. The effects of de-listing Young Bay and managing it under a "Natural Setting" land use designation, which would occur under Alternative 1, were also found to be negligible. No change in this analysis has occurred.

Fire Management

Affected Environment

The occurrence of wildfires within the Tongass National Forest has been historically low, due largely to the annual rainfall in Southeast Alaska which averages over 100 inches. National Fire Data Library records show an average of only 14 fires per year for the 30-year period 1958-1988. The majority of these are considerably less then one acre and the average size of all fires is less than seven acres.

Recreational fires that are left unattended comprise about 92 percent of fire occurrences in Southeast Alaska. These tend to spread very slowly and burn deeply; unsuppressed, they can result in some resource losses. Most other fires are equipment fires caused by contractor or other equipment activities. These fires are commonly associated with heavy concentrations of dead, woody logging debris (such as slash piles), and tend to be larger than recreational fires. Equipment fires, because of their potential to grow larger, generally require more fire suppression forces. In recent years, the prescribed fire program on the Tongass National Forest has increased. Prescribed burning programs use fire as a tool in accomplishing silvicultural and wildlife resource management objectives. This trend is expected to continue.

Environmental Consequences

Fire has not been an important agent of change in Southeast Alaska and is not expected to be in the foreseeable future. Forest fuels and fire occurrence are two aspects of the fire environment potentially sensitive to the management activities proposed by alternatives. Both these aspects were discussed in the 1991 SDEIS. The accumulation of forest fuels in harvest areas will vary by alternative, generally in direct relation to the volume harvested. Although present, the risk of large equipment-caused fires is relatively low. All alternatives project increases in recreational uses, and thus anticipate some increase in recreation-related fires.

All of the alternatives provide for the suppression of wildfires to protect Forest resources and the property and lives of adjacent landowners. As the knowledge of the use and effects of prescribed burning increases, so may its use. However, no specific acreage of prescribed fire is projected for any alternative. Prescribed fire will be evaluated at the project level prior to use. The use of prescribed fire could result in reductions in the cumulative fuel loading of the Forest over time.

Mitigation

Forest Service timber sale contracts specify the measures, additional people, and equipment required for the prevention, early detection, and suppression of fires within a project area. Intensified fire prevention contacts are used to increase public awareness. Prescribed fire activities are planned to control the intensity and duration of the fire, thus minimizing adverse effects to vegetation and soils. Low- to moderate-intensity fires are used to protect the duff layer and maintain soil nutrients. Also, to reduce effects on air quality, burning is scheduled for times when conditions permit dispersion away from smoke-sensitive areas. All Forest Service burning is done in compliance with Alaska Department of Environmental Conservation open burning regulations.

Fish

Affected Environment

Fish and the aquatic resources on the Tongass National Forest provide major subsistence, commercial, sport fisheries, and traditional and cultural values. Abundant rainfall, streams with glacial origins, and watersheds with high stream densities provide an unusual number and diversity of freshwater fish habitats. These abundant aquatic systems of the Tongass provide spawning and rearing habitats for the majority of fish produced in Southeast Alaska. Maintenance of this habitat, and associated high quality water, is a focal point of public, State and Federal natural resource agencies, as well as user groups, Native organizations and individuals.

Fish are a major component of the biodiversity of Southeast Alaska. The annual spawning migrations of anadromous fish are necessary for the function of many plant and animal communities. Wilson and Halupka, in their discussion of anadromous fish as keystone species, list 36 birds and mammals which consume salmon or salmon eggs in Southeast Alaska (1995). Animals such as black and brown bear and bald eagle are known to have significant dependence on spawning salmon, or their carcasses, for over-winter survival. Concentrations of bald eagles and gulls (sp.) feeding on spawning hooligan suggest these fish are an important source of food which is available during early spring, before salmon runs begin.

The 1991 SDEIS contains detailed information on the fisheries resource: fish species, fish habitats, the effects of past management, use, and demand. Except for some minor updating, that information is valid today and can be briefly summarized. New information resulting from an interagency fish habitat assessment is included at the end of the affected environment summary.

The Forest includes approximately 45,000 miles of known streams, more than any other in the National Forest system, and 20,900 lakes and ponds totaling 278,000 acres. Anadromous fish habitat includes 10,800 stream miles and 4,100 lakes and ponds, and another 12,200 stream miles and 4,700 lakes and ponds provide non-anadromous fish habitat. Most of the Forest's streams and rivers empty into bays or estuaries which are important during some life stages of anadromous species as well as for many saltwater fish species. Thirty-seven freshwater and anadromous fish species are found in the freshwaters of Southeastern Alaska. The principle species harvested for sport, subsistence or commercial uses are shown in Table 3-15.

Subsistence and commercial harvest of fish provide a way of life and a major source of food for many Southeast Alaska residents. Sport fishing is a favorite activity of residents and visitors. Hatcheries, and the enhancement of wild fish, among other aquaculture projects, contribute to resource availability and abundance. The Alaska Department of Fish and Game is responsible for regulating the amounts of fish harvested. Subsistence fish harvest is discussed in the Subsistence section of this chapter.

Commercial fish harvest in the waters of Southeast Alaska can fluctuate widely from year to year. For example, salmon harvest in Southeast Alaska averaged approximately 50 million fish between 1935 and 1940, then declined steadily to less than 20 million fish in about 1950. From 1950 to 1975 harvests were generally low, falling below 6 million fish in 1975. Since 1975 there has been an increasing trend, reaching 60 million in 1985, and setting a record of about 76 million fish in 1994. Fluctuations in

Table 3-15
Commonly harvested sport, subsistence and commercial fish

Species [1]	Sport	Subsistence	Commercial
Pink salmon (*Oncorhynchus gorbuscha*)	X	X	X
Chum salmon (*Oncorhynchus keta*)	X	X	X
Coho salmon (*Oncorhynchus kisutch*)	X	X	X
Sockeye salmon (*Oncorhynchus nerka*)	X	X	X
King salmon (*Oncorhynchus tshawytscha*)	X	X	X
Cutthroat trout (*Oncorhynchus clarki*)	X		
Rainbow trout & steelhead (*Oncorhynchus mykiss*)	X	X	
Dolly Varden char (*Salvelinus malma*)	X		
Eulachon smelt (*Thaleichthys pacificus*)		X	

[1] Alternate names commonly used for the same species are: pink or humpback; chum or dog; coho or silver; sockeye or red; king or chinook; and eulachon or hooligan or candlestick.

commercial harvest trends may be partly attributable to changes in ocean productivity. The productivity of marine waters in the Gulf of Alaska, and the survival of salmon and steelhead trout, are both highly variable and cyclic. Since the mid-1970's, favorable ocean currents have resulted in high productivity and, consequently, high marine survival of salmon (AFHA, 1995).

Approximately 85 percent of Southeast Alaska's sport fishing occurs in the vicinity of the Tongass National Forest. Sport fish use has increased with a generally steady trend over the past two decades, almost doubling since the late 1970's.

Numerous fishery enhancement projects, and a variety of hatchery and other aquaculture projects, have been developed on the Forest. Coordination and construction of projects to meet fisheries goals occurs at multiple levels and by a number of different organizations. Three groups coordinate fish enhancement and development activities in Southeast Alaska: the Northern and Southern Southeast Regional Planning Teams, and the Yakutat Salmon Planning Group; "Comprehensive Salmon Plans" have been developed for the three areas: Northern Southeast, Southern Southeast, and Yakutat. The Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, facilitates the activities of the coordinating groups. Many organizations are involved with aquaculture projects, including the State of Alaska, private non-profit aquaculture organizations, Regional Aquaculture Associations, the USDA Forest Service, and additional cooperators. Between 1980 and 1989, 104 fisheries enhancement projects coordinated by the Forest Service provided an estimated production potential of approximately 11.5 million pounds of fish. Allowing for fish enhancement projects in wilderness areas, as permitted by ANILCA, has been an issue in the past.

Other environmental factors that may affect habitat capability include stream temperatures and stream flows. These were discussed in the 1991 SDEIS. Forest-wide, no significant effects are anticipated relative to these factors. Further considerations of effects were made by scientific panel assessors (see Panel Assessment later in this section).

In all public scoping, a common advocacy of the public has been the maintenance or improvement of fish habitat values. Demand from the public for subsistence, commercial and sport harvested fish remains very high. Demand for subsistence fish is discussed in the Subsistence section of this chapter, while commercial and sport fish demand are reviewed in this section. Commercial fish demand is based on goals set by Regional Salmon Planning Teams for annual fish production for several species. Some of the "year 2000" goals were set almost 15 years ago, and have not been updated. Estimated potential fish harvests are between 46 and 84 percent of the year 2000 goals, although the actual annual harvests vary considerably and sometimes exceed either potential harvest or the harvest goals (1991 SDEIS). National Forest habitats are estimated to contribute approximately 80 percent of the fisheries in Southeast Alaska. A comparison of current harvest and the goals for fish production in Southeast Alaska indicates that Tongass National Forest-related harvest is at approximately the target set by the Regional Salmon Planning Teams for king salmon, and approximately 40 percent below the targets for the other species of salmon.

In the 1991 SDEIS sport fish demand is calculated using past sport fishing and projecting the same rate of increase. Using these figures, in the next 20 years, sport fishing could increase 34 percent. Recent Southeast Alaska information indicates that while the number of resident anglers has declined slightly since 1991, numbers of non-resident anglers increased from about 40,000 to 80,000 from 1991 to 1994.

Fish habitat improvement projects have been implemented across the Tongass. The estimates of salmon production resulting from habitat improvement projects completed from 1980 to 1989 suggest that at full production, over 11 million pounds of salmon are produced annually on the Forest. Because of decreases in available project funding and plan modification as a result of project monitoring the 1991 SDEIS project list is no longer accurate.

The 1991 SDEIS includes a discussion of fish habitats in terms of stream class and stream channel "process groups." Stream classes describe stream values, such as whether anadromous or resident fish inhabit a particular stream. Process groups describe the interrelationship between watershed runoff, landform relief, geology, and glacial or tidal influences on fluvial erosion or depositional processes. Process groups are used for assigning the Riparian standards and guidelines. Appendix D of the Proposed Revised Forest Plan describes the process groups.

In 1993 the Forest Service implemented a strategy, termed PACFISH, for the management of salmon and steelhead habitats on National Forests in Alaska, California, Idaho, Oregon and Washington. This strategy was in response to diminishing runs of many Pacific salmon throughout much of their range, except Alaska. Studies indicated fish habitat in areas which have experienced heavy timber harvests exhibited reduced stream complexity, including over-widening of stream channels, loss of pool habitat and in some cases increases in occurrence of bedrock which indicates stream channel degradation. Loss of fish habitat occurred in spite of increasingly restrictive application of Best Management Practices. PACFISH was never implemented in Alaska, however an assessment of salmon habitat (the Anadromous Fisheries Habitat Assessment) was later completed.

The Anadromous Fisheries Habitat Assessment

During 1994 an Alaska Anadromous Fisheries Habitat Assessment (AFHA, 1995) was conducted, as directed by the 1994 Congressional Appropriations Conference Committee Report. The purpose of this assessment was to evaluate the effectiveness of current procedures in protecting anadromous fish habitat and to determine if any additional protection measures were needed. The assessment involved more than 50 scientists and managers, and included a review of more than 1,540 publications, a field review by a group of experts in disciplines related to the health of fish habitat, an analysis of three watersheds by teams of professional fish and watershed specialists and a peer review of the report prior to release. The AFHA report concluded that current measures, and their implementation (defined as activities implemented on the ground since TTRA passage in 1990), were not fully effective in preventing habitat degradation or protecting salmon and steelhead stocks over the long term. A primary concern was lack of protection for headwater streams (usually small streams high up in the watershed). Other concerns expressed by the field reviewers were:

- Stream buffers generally should be wider than 100 feet, be consistent with site specific topography, and be designed to be windfirm.
- Timber harvest and roading activities on potentially unstable slopes should be reduced or eliminated.
- Road construction techniques need more attention, particularly where roads cross wetlands. The location of cross drainages and passage requirements for fish were noted to sometimes be problems.
- Sediment routed to streams can be reduced by addressing culvert blockage problems, and structure and road prism failure problems, with higher levels of road maintenance or more road closures (following harvest activities).
- Greater use of specialists in timber planning and providing more training for them, should reduce risks to fish habitat.

The assessment included many recommendations to make timber harvest more compatible with the maintenance of high-quality fish habitat. Among these were: increasing protection over the minimum required for headwater areas; enlarging streamside buffers in flood plains and confined alluvial channels; establishing quantitative objectives for evaluating fish habitat capability; increasing monitoring of fish habitat protection procedures, and evaluating and improving the Best Management Practices; and implementing more comprehensive watershed analyses. The Fish Habitat Analysis Team (FHAT), which conducted the on-the-ground analysis for AFHA, made further recommendations for improving management in riparian areas (FHAT, 1994). These sets of recommendations were considered in developing options for the proposed Riparian standards and guidelines and included in Riparian Options 1 and 2 (described in Chapter 2; and in detail in the Proposed Revised Forest Plan, Chapter 4).

Environmental Consequences

The 1991 SDEIS estimated the potential effects of management alternatives on three management indicator species, coho salmon, pink salmon and Dolly Varden char. Habitat models were used to estimate potential effects on those management indicator species.

The coho salmon and Dolly Varden char model was largely driven by the quantity and quality of pool habitat, including the presence of pool forming large woody debris. The model predicted available rearing habitat for these fish and has proven useful during fish pass project development in evaluating potential rearing habitat above fish barriers. The model is, however, untested, and its reliability for determining potential effects of timber harvest on coho salmon and Dolly Varden char is not known. Because the model has not been validated it was not used in this analysis.

The development of a pink salmon model, which considers the effects of sediment on pink salmon spawning success, has not been completed.

Direct, Indirect and Cumulative Effects

Two separate, fisheries related, assessments have been completed since the 1991 SDEIS. The Anadromous Fish Habitat Assessment was discussed above, and contributed to the development of the riparian management options used in developing alternatives. The Fish/Riparian Assessment Panel, completed in 1995, serves as the basis for the first part of the following discussion of environmental consequences. Additional discussions focus on unstable soils, roads, and the riparian options.

Fish/Riparian Panel Assessment Elements

The panel process is described in general in the Introduction to this chapter. The Fish/Riparian Assessment panel included four fisheries scientists and two physical scientists (hydrology and geomorphology).

The fisheries scientists rated five possible outcomes for each of eight species of fish, including both resident and anadromous life strategies for two of the species. The fish considered in the assessment were:

- sockeye salmon (*Oncorhynchus nerka*)
- chinook salmon (*Oncorhynchus tshawytscha*)
- pink salmon (*Oncorhynchus gorbuscha*)
- chum salmon *(Oncorhynchus keta)*
- coho salmon (*Oncorhynchus kisutch)*
- steelhead trout (*Oncorhynchus gairdneri)*
- cutthroat trout - anadromous (*Oncorhynchus clarki*)
- cutthroat trout - resident *(Oncorhynchus clarki*)
- Dolly Varden char - anadromous *(Salvelinus malma)*
- Dolly Varden char - resident *(Salvelinus malma)*

The outcomes used by the fisheries scientists to predict habitat conditions, for purposes of relative comparison of Forest plan alternatives, were:

> **Outcome I.** New management activities will not cause additional degradation of freshwater habitat for the species. Productive habitat will be well distributed across the Forest, or the historic range of the species within the Forest. Habitats that are currently degraded will recover or be moving toward recovery after 100 years.

Outcome II. New management activities will result in minor additional degradation of freshwater habitat for the species. Productive habitat will be adequately distributed across the Tongass National Forest, or the historic range of the species within the Forest. Most habitats that are currently degraded will recover or be moving toward recovery after 100 years.

Outcome III. New management activities will result in moderate additional degradation of freshwater habitat for the species. Distribution of productive habitat across the Tongass National Forest, or the historic range of the species within the Forest, will contain some gaps where the species will not occur or where populations will be severely reduced. Many habitats that are currently degraded will not recover or be moving toward recovery after 100 years.

Outcome IV. New management activities will result in major additional degradation of freshwater habitat for the species. Distribution of productive habitat across the Tongass National Forest, or the historic range of the species within the Forest, will contain large gaps where the species will not occur or where populations will be severely reduced. Most habitats that are currently degraded will not recover or be moving toward recovery after 100 years.

Outcome V. New management activities will result in severe additional degradation of freshwater habitat for the species. The species will be extirpated or populations will be decimated over much of its historic range on the Tongass National Forest. Habitats that are currently degraded will not recover or be moving toward recovery after 100 years.

The physical scientists rated five possible outcomes for the potential effects of land use alternatives on the natural conditions of streams. Natural conditions were defined in terms of the following attributes:

- large woody debris (pieces/1,000 m^2 greater than 10 cm in diameter and 1 m long).
- percent pool area
- stream width-to-depth ratio
- pools per reach
- residual pool depth
- stream bed grain size distribution.

The physical scientists predicted channel conditions using the following outcomes:

Outcome I: Riparian objectives will be met throughout the Tongass National Forest. There will be little or no additional degradation from existing conditions due to new management activities. Areas currently not meeting riparian objectives will recover or be moving toward recovery in 100 years.

Outcome II: Riparian objectives will be met throughout most of the Tongass National Forest. There will be minor additional degradation from existing conditions due to new management activities. Most areas currently not meeting riparian objectives will recover or be moving toward recovery in 100 years.

Outcome III: Riparian objectives will be met on much of the Tongass National Forest, but there will be a substantial area where they are not met. There will be moderate additional degradation from existing conditions due to new management activities. Many areas currently not meeting riparian objectives will not recover or be moving toward recovery in 100 years.

Outcome IV: Riparian objectives will be met on a small part of the Tongass National Forest, but they will not be met over the majority of the Forest. There will be major additional degradation from existing conditions due to new management activities. Most areas currently not meeting riparian objectives will not recover or be moving toward recovery in 100 years.

Outcome V: Riparian objectives will be met on a very small part of the Tongass National Forest. Almost all areas will not meet riparian objectives. There will be severe additional degradation from existing conditions due to new management activities. Areas currently not meeting riparian objectives will not recover or be moving toward recovery in 100 years.

The Fish/Riparian panel used two time periods for assessing outcomes. The primary focus was on the longer-term (100 years), as stated in the outcome descriptions. A 10-year assessment was also made. The 100-year assessment is discussed first; the tables include both the scores.

The assessment panel outcome conclusions and comments fall into the two main categories: fish and stream channel morphology. Fish, for the purposes of this discussion, are divided into three sub-categories: chinook, sockeye, and an other category of “stream spawning fish” in which coho, pink and chum salmon, steelhead and cutthroat trout and Dolly Varden char are included. This subdivision is used to assist in summarizing the panel findings and does not imply that each of the fish species in the combined category are necessarily equal in all assessment findings.

Chinook Salmon. Chinook salmon typically spawn and rear in large river systems, which are often transboundary (flowing out of Canada into Alaska). The panelists believed most of the large river systems had little or no management activities taking place in their watersheds; and because of the watershed’s large sizes, management activities that do occur would have little impact. Chinook salmon were assigned the highest number of points, of all species, for Outcome I across all alternatives, indicating that chinook would be least affected by management actions (see Table 3-16).

Table 3-16
Average 10 Year and 100 Year Outcomes for chinook salmon by Alternative

Outcomes	Alternative 1		2		3		4		5		6		7		8		9	
	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100
I	94	94	88	88	90	89	90	89	90	89	88	88	86	85	88	88	88	88
II	7	7	8	9	9	10	9	10	9	10	11	9	13	11	11	9	11	9
III	0	0	4	4	1	1	1	1	1	1	1	4	1	4	1	4	1	4
IV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note that because these are averages they may not sum to 100 points.

Sockeye Salmon. Sockeye salmon typically spawn and rear in lakes. A few sockeye salmon populations spawn and rear in streams; some migrate upon emergence from the gravel to rear in salt or brackish water. Because of the sockeye salmon's preference for lake habitat, panel members assigned higher proportions of the likelihood points, across all alternatives, to outcomes I and II, than they did for stream-rearing fish (see Table 3-17). The panel felt that lake habitats, because of the protection afforded them in all alternatives (no commercial timber harvest within the riparian area or 100 feet, which ever is greatest, and only uneven-aged management within the next 400 feet) and because of their natural resiliency to impacts, would be less affected by management activities. Likelihood scores assigned to Outcomes II through V recognize some detrimental affects could occur due to management activities with the greatest potential effects in Alternatives 7 and 9. The panelists singled out sediment from roads as the most likely cause of detrimental effects.

Table 3-17
Average 10 Year and 100 Year Outcomes for sockeye salmon by Alternative

Outcomes	Alternative 1		2		3		4		5		6		7		8		9	
	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100
I	90	92	43	50	70	72	70	72	73	73	45	52	43	48	45	52	43	50
II	10	8	15	22	20	22	23	20	23	22	18	23	15	22	20	22	15	20
III	0	0	40	25	10	7	8	8	5	5	38	22	38	23	33	23	38	25
IV	0	0	3	3	0	0	0	0	0	0	3	3	5	5	3	3	5	3
V	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2

Note that because these are averages they may not sum to 100 points.

Combined Stream Spawning Fish. A combined group of fish includes coho, pink and chum salmon, steelhead trout, cutthroat trout (resident and anadromous) and Dolly Varden char (resident and anadromous). Typically these fish use streams or rivers for spawning, and their fry, upon emergence, rear in the stream habitat for one or more years (resident Cutthroat trout and Dolly Varden char depend on freshwater systems, including streams, throughout their life-cycle); or, as with chum and pink salmon, migrate to salt or brackish waters to rear. The panelists expressed a general opinion that the relative risk to each of these species could be influenced by the proportion of their life cycle spent in the freshwater ecosystem. Since resident cutthroat trout and resident Dolly Varden char are dependent on freshwater ecosystems throughout their lives, they could be at greatest risk. Since steelhead trout and coho salmon both spawn and rear (for one or more years) in freshwater, they may be at greater risk than pink and chum salmon. Pink and chum salmon rear in saltwater after emergence from freshwater incubating habitats.

Generally, as total miles of roads and acres of potential timber harvests increased by alternative, fewer likelihood points were assigned to outcomes I and II, and more likelihood points were assigned to outcome III and in some cases outcomes IV and V (see Table 3-18). Therefore the possibility of gaps in species distribution increases with increased miles of road constructed and acres harvested. For some species a gap in distribution may have greater significance than for others. Some species such as cutthroat and steelhead trout appear to have isolated populations which may be more susceptible to local extirpation. Species-specific comments are included in the Fish/Riparian panel assessment summary included in the planning record.

Table 3-18
Average 10 Year and 100 Year Outcomes for coho, pink and chum salmon, steelhead and cutthroat trout and Dolly Varden Combined by Alternative

Outcomes	Alternative																	
	1		2		3		4		5		6		7		8		9	
	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100
I	90	88	32	24	55	45	56	49	58	51	39	27	21	17	35	23	20	17
II	10	13	35	23	37	35	37	38	35	37	36	33	29	20	35	29	35	22
III	0	1	30	42	8	19	7	13	6	11	23	34	43	46	27	39	39	46
IV	0	0	5	11	1	2	1	1	1	1	3	7	8	16	4	9	6	15
V	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1

Note that because these are averages they may not sum to 100 points.

Stream characteristics. The occurrence of large woody debris, pool frequency and percent area, width-to-depth ratios, residual pool depth and grain size stream bed distribution, were stream characteristics considered by the panel to assess alternatives. The physical scientists agreed Outcome I could not be achieved under any management alternative (see Table 3-19). It was their judgment that watersheds already heavily disturbed by previous management would not be recovered in 100 years, and that current practices would continue to degrade some habitats.

The physical scientists suggested that as road mileage and acres of harvest increased, the likelihood that riparian management objectives would not be met increased. The entire panel generally felt that greater riparian protection, longer timber harvest rotations, and reserves (including Wild and Scenic river designation) increased the likelihood that riparian management objectives would be met. An assumption was made that greater numbers of roads would be located in higher elevations on less stable terrain and harvest would occur on less stable areas when compared to historical harvest and road construction. All panelists agreed that if this scenario were true, then the result would be a greater likelihood of hillslope failure, erosion of fine sediment from road surfaces, and capture and rerouting of natural drainage.

Table 3-19
Average 10 Year and 100 Year Outcomes for Physical Stream Characteristics by Alternative

Outcomes	Alternative																	
	1		2		3		4		5		6		7		8		9	
	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100
I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
II	95	90	0	5	40	35	45	40	50	45	35	30	0	0	5	10	0	0
III	5	10	85	70	55	60	50	55	45	50	55	60	65	60	85	70	70	65
IV	0	0	15	25	5	5	5	5	5	5	10	10	35	40	10	20	30	35
V	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note that because these are averages they may not sum to 100 points.

Long-term Effects of Alternatives

The panelists generally agreed on the possible relative outcomes of the management alternatives on the fisheries resources and stream channel attributes. This is demonstrated by identical rankings of alternatives by the two sets of panelists, although the physical scientists gave lower over-all scores to each alternative. Listed in order of increasing risk (least risk to greatest risk) to both the physical characteristics of stream channels and the species considered, the alternatives can be ranked in this order: Alternative 1, 5, 4, 3, 6, 8, 2, 9 and 7.

All panelists agreed that Alternative 1 presents the least risk to the fish resource. However, the physical scientists concluded there was no likelihood that no degradation from current conditions would be an outcome in any of the alternatives. Fisheries scientists assigned most points to Outcome I, that “new management activities would not cause additional degradation.”

Alternatives 3, 4 and 5 were assigned similar outcomes. The fisheries scientists assigned about half the possible points to the likelihood that Outcome I would be met. The physical scientists scored Alternatives 3, 4, 5 and 6 similarly but assigned Outcome III the most points, with Outcome II second.

In alternatives 2, 6, 7, 8 and 9 most likelihood points are assigned to Outcomes III and IV. This group of alternatives was viewed by the panel as having a greater likelihood that riparian objectives would not be met on a substantial area of the Forest or across the majority of the Forest where riparian habitat occurs, and that either some gaps, or large gaps, will occur in the distribution of fish relative to their historic ranges.

Discussions by Alternative. Panelists agreed that many past management activities, such as timber harvest and road construction and maintenance, will continue to contribute to degraded fish habitat and stream channel conditions. This current condition was considered across all alternatives, thus precluding likelihood points being assigned to Outcome I by physical scientists in any alternative. While discussing the likelihood of outcomes for each alternative, assuming each alternative was actually implemented, the panel (both biologists and physical scientists) reached the following conclusions:

Alternative 1. Low activity levels in a relatively small part of the Forest would reduce the level of additional degradation. This low activity level should also reduce the level of re-entry into previously entered areas, resulting in uninterrupted recovery of degraded watersheds.

Alternative 2. The road network and area harvested, particularly in high hazard soils, increases the likelihood of future habitat degradation and reduces the likelihood of habitat recovery due to re-entry into possibly already degraded areas. Riparian option 3 applied in all watersheds would likely be less effective in reducing risks to stream channels and fish habitat than the greater levels of protection offered by riparian options 1 and 2. Headwater areas are of particular concern since they are afforded less protection under option 3 than under options 1 or 2. These concerns decrease the likelihood of Outcomes I or II and increase the likelihood of Outcome III.

Alternative 3. A moderate network of roads and area harvested would increase the likelihood of areas of future habitat degradation and reduce likelihood of habitat recovery due to re-entry into possibly already degraded areas. Increased protection from riparian coverage in higher-value watersheds will likely mitigate many effects of roads and area harvested. The inclusion of large blocks of reserves (Old-growth Habitat LUD) increases the likelihood of recovery of degraded habitat within them.

Alternative 4. Similar to Alternative 3 except this alternative will have a higher likelihood of obtaining Outcomes I and II because longer harvest rotations should reduce disturbance levels. However, the lack of high levels of riparian protection and the absence of large blocks of old-growth forest reduce the likelihood points assigned to Outcomes I or II.

Alternative 5. Similar to Alternative 4, but additional large blocks of old-growth forest could reduce the likelihood of gaps and increase the likelihood of recovery of degraded habitat in these areas.

Alternative 6. Relatively large amount of area harvested and moderate network of roads (same as alternative 5) would increase the likelihood of gaps and decrease the likelihood of habitat recovery. Additional old-growth habitat reserves may offset some of effects of area harvested and amount of roads.

Alternative 7. An extensive network of roads and area harvested decreases the likelihood of obtaining Outcomes I and II and increases the likelihood of obtaining Outcome III. Riparian option 3 (applied to all watersheds) is less effective in reducing risk to fish than options 1 or 2. Headwater areas are of particular concern since they are afforded less protection under option 3 than options 1 or 2. The lack of estuary fringe protection increases risks to fish.

Alternative 8. A moderate network of roads and area harvested decreased assignment of likelihood points of Outcome I and II. Riparian Option 2 increases protection in key watersheds, reducing the possibility of gaps in fish distribution. The presence of large blocks of old-growth forest would reduce the possibility of gaps but only minimally because the fish were not part of the design criteria.

Alternative 9. An extensive network of roads and area harvested would decrease the likelihood of obtaining Outcomes I or II. The panel expressed concern about increased potential of future degradation and decreased potential of recovery of currently degraded habitat. TTRA riparian requirements, which lack protection for smaller non-fish-bearing streams, and the absence of additional reserves and estuary fringe, increases the level of risk to fish stocks and results in more likelihood points assigned to Outcome III.

Short-term Effects of Alternatives

After assessing 100-year outcomes, the panel assessed the likelihood of outcomes for the first decade of plan implementation. With the exception of sockeye salmon (Table 3-17), the relative risks of management activities negatively affecting the physical stream attributes or the fish species were less in a 10-year time period than a 100-year time period. The panel identified major storm events as the principle influence in the triggering of shifts in stream channel conditions. The panelists believed that the frequency of major storm events is such that the likelihood of a major storm occurring is less over 10 years than over 100 years. Additionally, a time lag exists for the effects of habitat degradation to be reflected in decreases in the size of fish populations, due to the length of time most of the fish in this assessment rear in the ocean before returning to spawn. The outcome distribution does reflect the panelists opinion that there are risks to stream channel processes and fish populations in a 10-year time period.

The distribution of likelihood points for sockeye salmon indicated a slight increase in risk. Upon closer examination it is apparent that this increase is probably an anomaly attributable to missing scores from one panelist.

General Effects Considerations from the Panel

Roads. The greatest risk to the fish resource is caused by roads. Increased sediment yield, including yields from roads during construction, use during timber harvest activities, and lack of sufficient maintenance or proper closure following timber harvest activities, were all viewed as potential problems for maintaining fish resources. Roads were also viewed as causing risk to fish movement due to blocked culverts. At highest risk were stream-rearing fish, particularly cutthroat trout, that occupy the smaller headwater streams during some parts of their lives. Juveniles of stream-rearing fish are often highly mobile during their freshwater stage, moving seasonally between stream reaches. Some panelists expressed concern over the high likelihood that road failures would occur in heavily roaded watersheds. The consensus was that the rate of failure was largely dependent on storm events.

Riparian protection options were thought to provide little reduction in the risks to fish or stream channels caused by roads during construction. Road construction practices were considered by the panel to be an area requiring additional attention to insure that risks to fish and stream channels are not excessively high. Roads were also considered by the panel to increase the risk that improved access would contribute to over-harvest of fish by anglers.

Timber Harvest. Timber harvest activities increased risk to fish resources. Of particular concern was the protection of riparian areas including flood plains, areas of riparian vegetation, and certain wetlands associated with riparian systems. Also of concern was the amount of protection afforded steeper channels (often not fish-bearing) in the headwaters areas. Panelists considered it important to maintain the natural function of these steeper channels, including the V-notches. Forested leave strips were considered to be an important measure to insure protection of headwater areas. Protection of estuaries was also considered important when locating roads and timber harvest units. Adequate buffers between estuaries and logging and roading activities were considered in the point likelihood distribution. The panelists considered maintaining a high level of riparian protection to be important. All alternatives with lower relative levels of riparian protection exhibit higher panel ratings of risk to fish resources. Panelists agreed that, even with the highest level of riparian protection the risk of detrimental effects on fish would still be relatively high, in heavily impacted watersheds, due to cumulative impacts throughout the watershed.

Watershed Analysis. The panelists identified watershed analysis as an important tool in tailoring riparian protection measures and road layout to site-specific conditions. Watershed analysis is considered to be “indispensable” if consideration is being given to modifying riparian protection guidelines to provide less protection: the application of watershed analyses would do much to avoid potential adverse effects to fish resources during resource management activities. Concern was expressed that standards be identified for an acceptable level of watershed analysis. (See Fish Forest-wide standards and guidelines in Chapter 4 of the Proposed Revised Forest Plan.)

Riparian Protection Options. The panel supported the application of different levels of protection for riparian areas associated with different levels of fish values. However, the panelists believed that all alternatives should receive Option 1 protection for the highest valued watersheds for fish and nothing less than Option 2 protection across the remainder of the watersheds. The additional protection afforded high gradient streams, particularly V-notches, by Options 1 and 2 were thought to be particularly important to reducing the risk to stream channels and fish. The group believed stream channel conditions were degraded and risks to fish increased as timber harvest and the associated roads occurred at higher elevations in the watershed, on steeper slopes and on less stable soils. The buffers prescribed in the Riparian protection options were recognized to be subject to blowdown. The panelists believed generally as the buffer widths increased the risk of total buffer blowdown decreased.

Additional Effects Analysis

Scope of the potential effects. Past measures to protect fish habitat from the negative effects of land-disturbing management activities have focused primarily on site-specific conditions or stream reaches. Recent efforts to address salmon population declines in the Pacific Northwest broadened the scope of the analysis from the stream reach level to the watershed level. Both the Anadromous Fish Habitat Assessment (AFHA) and the Fish/Riparian Assessment Panel considered the effects of management activities in the context of watershed function and stream channel process. Fish populations can be affected by activities which alter the natural watershed processes.

Although there are specific measures in each alternative designed to reduce the likelihood of significant degradation of fish habitat, there is a risk to fish associated with management activities planned under each alternative. The likelihood of habitat degradation increases with increases in miles of roads constructed and levels of road maintenance accomplished, as well as with the amount, rate and location of timber harvest within a watershed.

Except for Alternative 1, all alternatives increase the likelihood that fish dependent on the freshwaters of the Forest could be negatively affected by management activities. VCU's generally follow watershed boundaries and for planning purposes they can be considered as watersheds. Timber harvest and associated management activities planned in those watersheds, in each alternative, have the potential to negatively affect stream channel processes, and thus fish habitat. Except for Alternative 1, timber harvest activities on the Forest could potentially affect from 48 to 60 percent of the total Tongass anadromous and high value fish habitat (Figure 3-3). The analysis shows a lack of distinct differences in miles of class 1 streams which could potentially be affected in all alternatives (excepting Alternative 1 and to a much less extent Alternatives 7 and 8). This suggests that fish habitat may be better protected with a higher level of riparian protection than by the application of reserves or non-timber management criteria.

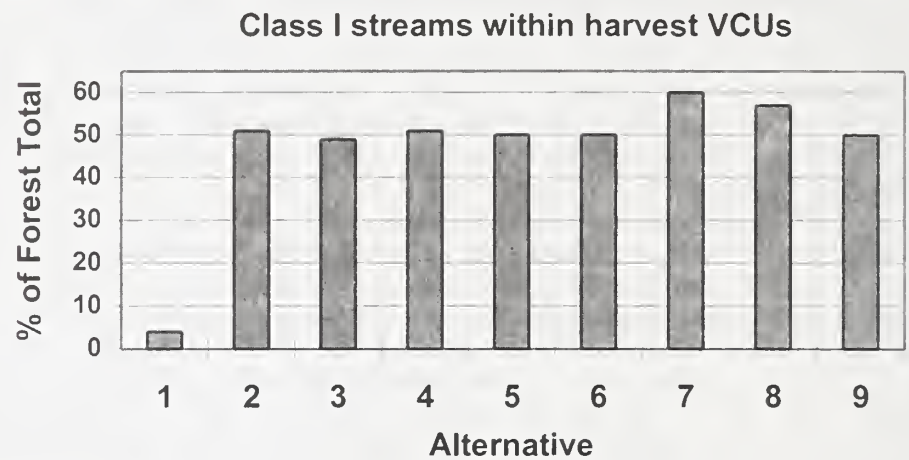


Figure 3-3
The percentage of Forest-wide total class 1 streams occurring in the VCU's entered for timber harvest, by alternative, by year 2095.

Unstable terrain. Concerns were raised in both the AFHA report and the Fish/Riparian Panel Assessment that future management activities would occur more frequently on steeper slopes and on more hazardous soils than did past management activities. Increased timber harvest and road construction in these areas increases the likelihood of landslides which transport large quantities of sediment and woody debris. Upon reaching streams this material blocks or shifts channels, alters existing habitat structures, and can fill-in pool rearing habitats and increase the percentage of fines in spawning gravel. These changes in fish habitat would likely decrease the habitat capability to produce fish.

Soils classified as high hazard, or MMI 3 (generally on slope gradients of 55 to 72 percent) are soils where natural mass failures or landslides are small and infrequent but that have a moderate to high risk of management-induced mass failure. The upper range of MMI 3 soils (65 to 72 percent) generally have a higher risk of mass failure than do the soils in the lower range (55 to 64 percent). MMI 4 soils (slopes greater than 72 percent) are soils where risk of mass failures are unacceptably high, and these have been removed from the tentatively suitable timber base. Some small inclusions of MMI 4 soils are found in the total acres of MMI 3 soils in this analysis. Analysis indicates that the amount of harvest on slopes of 65% and greater will increase over the past harvests on the same percent slope. Increased risks to fish habitat are excpected to occur as a result of operating on steeper slopes. Figure 4 provides a comparison of 10-year acres of harvest, by alternative, for those soil within the upper range of MMI 3 soils (and MMI 4 inclusions).

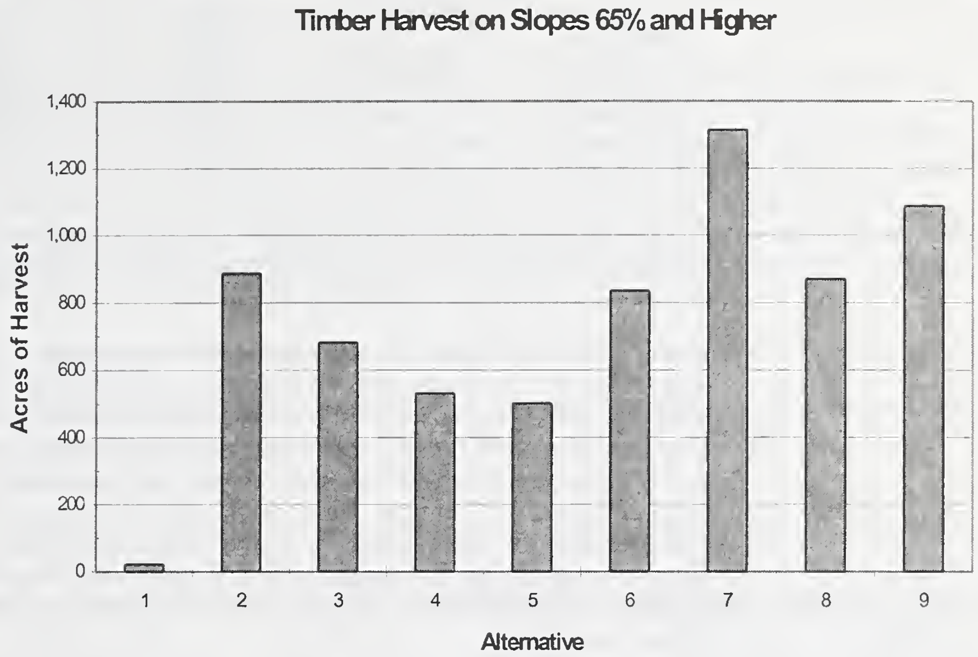


Figure 3-4
Estimated acres of harvest for ten-years, on slopes of 65% or greater, by Alternative.

Roads. Both the AFHA report and the Fish/Riparian Panel Assessment expressed concern about the negative effects of road construction and maintenance on fish habitat. Roads can potentially create areas of hillslope instability resulting in landslide generation, contribute fine sediment from surface erosion, block fish migration, and alter surface and subsurface water flow patterns. As future harvest activity will increase proportionately on steep slopes (see above), a corresponding increase in miles of both system and temporary roads on steep and less stable terrain is also expected. Greater use of helicopter logging could offset some of this activity.

Table 3-20 shows the miles of existing roads and projected road construction in VCU's where timber harvesting may occur. At the end of 100 years of Forest plan implementation the estimated system road density among alternatives ranges from 1.02 to 2.00 miles/mile^2. Road development will be more intensive early in the 100-year period, with nearly all of the construction being completed during the first 50 years.

Table 3-20
Miles of system roads existing and planned by Alternative [1]

	Alternative 1	2	3	4	5	6	7	8	9
Existing Rds	565	4,364	4,335	4,375	4,350	4,350	4,377	4,356	4,327
New Roads	N/A	11,162	7,640	6,258	5,869	9,782	15,391	9,690	14,018
Total Roads	565	15,526	11,975	10,633	10,219	14,132	19,768	14,046	18,345
% Increase	N/A	356%	276%	243%	235%	324%	452%	322%	424%
Rd. Density per sq. mi.	1.02	1.67	1.35	1.14	1.11	1.53	2.00	1.23	1.89

[1] Only roads in VCUs to be entered for timber harvest, in each alternative, are included. Road (Rd.) density calculations are based on the area of the VCUs being entered for timber harvest. (The FORPLAN model did not calculate road mileage for Alternative 1 because of low levels of harvest.)

System roads in Region 10 are designed with consideration for resource protection, legal obligations, total cost and the importance of the road. As a general rule, Region 10 Best Management Practices (BMPs) recommend that bridge crossings for system roads be designed to pass not less than a 50-year to a 75-year flood. Culverts for Class I, II, and III streams are recommended to be designed to pass not less than a 25-year to a 50-year flood. The American Fisheries Society (Furniss et al. 1991), recommends a 100-year flood as the minimum for bridges and large culverts and a minimum 50-year flood for other drainage structures. Best Management Practices guidelines allow a greater risk of degradation to fish habitat than do standards designed specifically for fish habitat protection.

Temporary roads are roads which are anticipated to be utilized only for the duration of timber sale activities and are not designed to as high of an engineering standard as are system roads. Because of the temporary nature of these roads (often intended to be used for less than one year) investments in stream crossings structures and road surfacing are much less than are similar investments in system roads. These temporary roads may create greater short-term risks to fish habitat than do system roads. They may also create greater long-term risks when cumulative effects are considered. Miles of temporary roads anticipated for the first decade under each alternative are displayed in Table 3-21.

Table 3-21
Estimated miles of temporary roads to be constructed during a 10-year period [1]

	Alternative 1	2	3	4	5	6	7	8	9
Miles of temp. Roads	0	489	278	145	138	362	689	364	513

[1] Actual miles of temporary roads in alternative 1, 4 and 5 are likely to be higher than the numbers indicated in this table. Miles of temporary roads constructed for partial harvests (uneven-aged management) are likely to be greater than the miles of roads constructed for the same timber volume of clear-cut.

Riparian Management Options. The AFHA report indicated that current practices are not fully effective in preventing habitat degradation or protecting salmon and steelhead stocks over the long term. To address this concern, a range of options have been developed to further protect fish. Various combinations of these options were applied to the plan alternatives. (See Riparian Management Standards and Guidelines, in Chapter 4 of the Proposed Revised Forest Plan for definitions and further discussion.)

Riparian Option 1 significantly increases riparian protection above the recommendations made in the AFHA report. Option 1 will most likely allow little, if any, additional degradation of fish habitat over the long run. Riparian Option 2 includes most of the recommendations brought forward by the AFHA report. This option is less protective than Option 1, but more protective than Option 3. Option 3 is similar to current practices, although it may be slightly better than current practices in some guidelines. Option 3 is more likely to allow degradation of fish habitat than Options 1 and 2. See Table 3-22.

Table 3-22
Riparian management levels applied in each Alternative, and percentage of streams in timber harvest VCUs receiving Option 2 (AFHA recommended protection level) protection. [(1)]

	Alternative								
	1	2	3	4	5	6	7	8	9
Total miles of streams in VCUs entered	1,691	23,977	22,988	24,045	23,807	23,807	28,308	27,189	24,556
FHIP1, watershed level of protection	Opt 2	Opt 3	Opt 1	Opt 2	Opt 2	Opt 2	Opt 3	Opt 2	TTRA /BMP
% of total streams protected with Option 2 or higher	21	0	100	20	20	20	0	20	0
FHIP2,3 VCU level of protection	Opt 3	Opt 3	Opt 2	Opt 3	Opt 3	Opt 3	Opt 3	Opt 3	TTRA /BMP
% of total streams protected with Option 2 or higher	0	0	100	0	0	0	0	0	0

[(1)] Stream miles include all streams in the watershed and/or watershed.

Watershed Reserves. In alternatives 3, 5, 6 and 8 reserves are implemented to address viability concerns for fish and wildlife (see Chapter 2, Table 2-1 for application of reserves by alternative). The 1991 SDEIS recognized that regardless of the level of fish habitat protection, some level of risk remained that fish habitat could be negatively impacted by some management activities. To further reduce that level of risk, watershed reserves are identified to maintain a spatial distribution of watersheds in which no timber harvest would occur (Kessler et al., 1995). The Alaska Department of Fish and Game, Commercial Fisheries Division statistical troll areas are used as the template to determine spatial distribution. Legislated reserves (such as Wilderness and legislated LUD II areas) were found in all but three statistical troll areas. These three areas were further examined and watersheds in two of the three areas were recommended for reserve designation. No reserve was recommended for central-western Prince of Wales Island. The proposed reserve strategy does not address all fish viability concerns, particularly in light of the lack of information on genetically discrete salmonid stocks, the relative significance of various fish stocks, and the importance of meta-populations throughout Southeast Alaska. The reserve strategy, if fully implemented, does however address the National Forest Management Act requirement of maintaining viable, well-distributed habitat across the Forest.

Alternatives 3 and 5 implement the full range of recommended habitat reserves. Alternatives 6 and 8 implement reserves in four provinces and the three additional watershed reserves identified specifically for fish.

Conclusion. In most alternatives, the natural range of variation in stream processes and resulting fish habitat will likely be negatively affected by management activities in the long run. The extent of harvest activity and associated road development are likely to result in decreases of some fish populations in managed watersheds. Measures taken to mitigate, or moderate, the negative effects have been incorporated into the alternatives in ways to provide differing levels of risk to the fisheries resource.

Forest Health

Affected Environment

Insects, diseases, and related decay processes are an integral and natural part of forest ecosystems. Many of these appear to play key roles in gap-level disturbance (see discussion of old-growth forests under Biodiversity) and in providing wildlife habitat in old-growth forests. Due to the nature of the forests in Southeast Alaska, which are primarily mature with few contiguous blocks of second growth, insects and disease have had limited effects on overall timber availability. Losses to the timber resource caused by heart rot of live trees are considerable in old-growth forests, however, and it is not uncommon for 30-40 percent of the volume of older live trees to be decayed and thus unusable for wood products. Growth loss, deformity, and mortality are the principle effects of hemlock dwarf mistletoe.. Presently, Alaska yellow-cedar has the highest market value of the commercial timber species of the Tongass. Continuing research leading to the reason for yellow-cedar decline could have a positive effect on future timber values.

In the future, the greatest potential forest insect and disease effects are likely to be in mature and overmature stands where disease levels are high. Tree vigor tends to decrease with maturity, causing an increase in susceptibility to insects and diseases. Heart rot levels are directly proportional to both tree and stand ages. The spruce beetle has the potential to significantly alter the desired condition of stands in certain locations near the mainland where the insect has periodically become active. Stem and root decay, and the incidence of hemlock dwarf-mistletoe, have historically increased with intensified land management activities, particularly under harvesting systems other than clearcutting. The adverse effects of these forest insects and diseases, at least in part, can be mitigated through silvicultural treatments

Environmental Consequences

In general, alternatives that favor low amounts of timber harvest will favor maintaining the high disease levels in old-growth forests. Ecological processes and wildlife habitat will be maximized, but so will the continued loss of timber, primarily due to high levels of heart rot. Higher amounts of timber harvest will generally yield young stands with little significant insect and disease activity. However, how the alternatives achieve these harvest levels varies, with some relying primarily on even-aged management, others on uneven-aged mangement. Uneven-aged management will maintain or even increase levels of heart rot and hemlock dwarf mistletoe. In general, endemic levels of insect and disease activity in mature and overmature forests will be allowed to run their course. Timber losses will be accepted, yet harvesting flexibility will be maintained to take advantage of timber salvage opportunities, particularly for dead and dying yellow-cedar stands. Insect and disease suppression may be justified in high quality, mature to overmature stands that cannot be salvaged immediately, or that lie near recreation areas and communities where scenic values are high.

Mitigation

Maintaining biotic and structural diversity provides an opportunity for limiting some insect and disease problems. Some insects and diseases are host-specific, depend upon plants which are under stress, or flourish under homogeneous conditions. In other cases, and particularly for heart rot, favoring younger-aged stands through even-aged management may be the most effective way of limiting insect and disease problems. Diversity can be influenced through processes outside the control of the land manager (such as windthrow or landslides), or purposefully directed.

The careful use of alternatives to clearcutting can be a tool for maintaining desirable but not excessive levels of diseases, such as heart rot and dwarf mistletoe, that have important ecological consequences. Integrated pest management provides the opportunity to evaluate these and more traditional clearcut practices. Through prescription processes, stands with unacceptable insect and disease-related losses as well as those of high risk for future losses will be identified for treatment. Detection methods such as aerial surveys, currently in use, will continue to be used for the early identification of epidemics.

Heritage Resources

Affected Environment

This section was formerly called Cultural and Historical, but these resources are now both included under the term "Heritage Resources." Heritage resources located within the Tongass National Forest include a diverse range of prehistoric and historic sites and artifacts that span approximately 10,000 years of human occupation and resource use. Prehistoric remains include campsites, village sites, graves, resource areas, rock art, portages, and rock shelters. Historic sites include houses, cabins, mines, quarries, trails, portages, canneries, boatworks, shipwrecks, and military installations. Many of these cultural remains provide the only record of former human occupation, work areas, and lifestyles. Many areas have traditional or spiritual significance for contemporary Native Americans. The heritage resources of the Tongass represent an important part of our local, regional, and national cultural heritage.

Between 1976 and 1994, approximately 149,000 acres of National Forest lands were inventoried for cultural resources, with over 2,000 cultural resource sites identified. These and more recent surface inspections account for less than one percent of Tongass National Forest acreage. A similar, relatively high, density of cultural sites is expected to be located within the Forest in the future. Specific locations associated with Native Alaskan traditional and religious use are identified on an ongoing basis. Information gathered from these inventory efforts provides information about heritage resource distribution and sensitivity to damage.

Certain types of heritage resources such as sites, artifacts, and other observable results of human activity have a greater probability of being located in specific areas, including intertidal zones, beach fringes, riparian zones, areas of known mineral deposits, areas of other known resources, and uplifted fossil beaches. The environmental characteristics that invited human use and habitation in prehistoric times are often the same factors which invite use today. However, because of elevational and sea level changes after deglaciation, the location of the earliest human activity areas may be further inland and at higher elevations than more recent human activity areas.

Environmental Consequences

The preservation and protection of the Forest's heritage resources are both closely associated with the location of the resource, the nature of the management activity, and the environmental characteristics where management activities occur. Effects on the resource may occur from natural forces, from public access, or from project-related activities.

Erosion and other environmental effects may deteriorate heritage resource sites through decomposition. Public use may destroy cultural resource sites through inadvertent damage caused by compaction or other ground-disturbing activities, or from vandalism and theft ("relic collecting"). Ground-disturbing activities have the most potential to adversely affect heritage resources and their environmental settings.

Land use designations allowing timber harvesting and road construction are most likely to affect the heritage resources through alteration of environmental settings or damage to unknown sites. In many instances, retention of a natural environment is crucial to imparting and protecting the values which qualify a cultural resource for National

Register status. Conversely, the opportunity for the identification of new sites is higher within these areas because of the intensity of inventory efforts. Direct impacts may occur to sites that are determined to be ineligible for the National Register of Historic Places. Mining activities may have similar effects. An indirect effect common to alternatives and prescriptions is that the discovery of new sites can lead to vandalism if locations become known to the public

Potential effects to cultural resources and the differences in risk between the alternatives are difficult to measure. Table 3-23 uses first-decade road construction miles and timber harvest acres as relative indicators of potential adverse effects. Since project areas are inventoried for cultural and historic sites prior to implementation, the levels of risk are considered relatively low for all alternatives. Alternatives 7 and 9 have the highest risk related to road construction, and Alternatives 7, 9 and 2 the highest risk from timber harvesting. Alternative 1 has no risk in the context of the table, but recreation and tourism activities also pose some risk under all alternatives.

Table 3-23
Average annual ground-disturbing activities, first decade

Alternative	Timber Harvest (acres)	Road Construction (miles)
1	0	0
2	167,672	1,791
3	94,338	1,212
4	49,432	633
5	47,120	602
6	123,178	1,577
7	232,414	2,983
8	123,253	1,589
9	177,477	2,643

Over time the effects of decay, neglect, and natural landscape changes threaten the preservation of significant cultural resources. Increased project activity could result in accelerated loss of cultural resources, primarily from indirect effects through increased public access and the potential for looting and vandalism of cultural resource sites.

Mitigation

All alternatives include requirements for inventory, protection, preservation, and interpretation, and for consultation with the State Historic Preservation Office as described in the Heritage Resource Standards and Guidelines (see Proposed Revised Forest Plan, Chapter 4). Effects are avoided or mitigated through a variety of measures. Mitigation of potential effects to cultural resources other than avoidance may include protective enclosures, systematic monitoring of project activities, or mandatory restrictions on project design. When impacts cannot be avoided, systematic recovery of the information through excavation, collection of materials, and detailed documentation may be required as determined through consultation with the State Historic Preservation Officer and the Advisory Council on Historic Preservation. Protection of significant heritage resource sites from public use includes the establishment of public education programs, maintaining confidentiality about specific locations, monitoring, and directing public use away from the vulnerable sites.

Karst and Caves

Affected Environment

The Tongass National Forest contains the largest known concentration of dissolution caves in Alaska. These caves, formed by the dissolving of rock by water, are found within a characteristic geologic landscape known as karst--lands underlain by carbonate (limestone and marble) rocks within which a subsurface drainage system has developed. The karst lands are recognizable by their internal drainage system, sink holes, collapse features, closed basins, and the presence of caves. Most caves in Southeast Alaska are found in karst landscapes. The karst and cave features and their associated resources are a recently discovered and recognized attribute of the Tongass, with national and international importance. The cave systems are extensive and diverse, and in general karst areas are being seen as distinct ecosystems with interrelated biological, mineralogical, cultural, and paleontological components, and unique recreational values.

Karst and Caves is a new section for the Revised Supplement. The 1991 SDEIS contained proposed Forest-wide standards and guidelines for caves, for consideration under the Federal Cave Resources Protection Act, which included some recognition of the karst resource, but no separate discussion or analysis. The information presented here is based on a recently completed Karst Resources and Caves Assessment (Tongass National Forest, 1995), which contains more detail and specific references.

The Federal Cave Resources Protection Act is the primary law recognizing caves. It requires protection of caves designated as significant on Federal lands, and gives criteria for determining significance. Although the intent of the Act is to protect caves specifically, caves and their associated resources are an integral part of the karst landscape. To fully protect the cave resource, the caves and their karst landscapes need to be managed as an ecological unit.

Characteristics of the karst ecosystem include: mature, well-developed spruce and hemlock forests along valley floors and lower slopes; increased productivity for plant and animal communities; highly-productive aquatic communities; well-developed subsurface drainage; and the underlying unique cave resources. The visible karst landscape also contains "epikarst," or surface features, particularly in the alpine and sub-alpine zones. These include deep shafts and fissures, eroded rills, and spires or spikes of limestone. The current karst inventory for Tongass National Forest lands includes 479,000 acres of karst areas.

Karst lands add a vertical, underground dimension to land use planning. Karst subsurface drainage networks generally operate independently of, and with more complexity than, the surface drainage systems above, and the watershed characteristics of the surface may have little or no relationship to the subsurface system. On karst lands, the many solution-widened fissures at the surface become entry points into the subsurface drainage system, where water and sediment from surface sources move vertically downward into the underground lateral systems. Sediment and water from disturbed lands or roads may enter this system at a single point and emerge unexpectedly at one or more distant springs, sometimes crossing surface watershed boundaries. Karst groundwater systems routinely transport water for several thousands of feet to receiving caves, springs, and surface streams.

Mechanisms of sediment transport are different between karst and non-karst landforms. A particle of soil in non-karst lands, as the result of landslides or surface water flow, may be transported laterally over relatively great distances into a watercourse to become sediment, although only a small proportion of these soil particles may actually reach a water course. Atop a karst landform, depending on the openness of the karst system, a soil particle may only need to be transported laterally a few inches or feet before being washed vertically down into the subsurface karst system. This openness is one reason for the vulnerability of karst to disturbance from management activities.

Most Tongass National Forest caves predate the most recent glaciation, as evidenced by the presence of glacial clays, glacial sediments, wood, Pleistocene vertebrate remains, and possibly even ancient ice. This glaciation modified a pre-existing karst landscape, collapsing some passages and systems, gouging into others, and filling some with sediments. The epikarst, which is exceptionally well developed in higher elevations, has been removed in places at lower elevations by glaciation. Where low-elevation epikarst is present, primarily on the outer coast of islands seaward of Prince of Wales, vegetation has re-established itself and a forested epikarst developed. With the development of the forested epikarst and peatlands, and the entrance of associated acidic waters into underground tributaries, a system of enlarged caves and vertical shafts has developed.

There is a definite tie between the karst landscape and the productivity of the spruce and hemlock forests found there. Dense stands of very large diameter spruce and hemlock at lower elevations are characteristic of many karst landscapes. The major contributors are believed to be the nutrient rich soils, well developed subsurface drainage, and dissected bedrock surface which allows the tree roots to hold fast and become more windfirm. The old growth on the karst provides a well structured, multi-layered canopy resulting in high quality winter habitat. The structure of the forest provides many forbs and shrubs for wildlife. It is possible that the available forage contains, at a minimum, higher calcium levels allowing for better bone, muscle, and antler development. The combination of quality forest structure and abundant nutritional browse make the karst landscape in general exceedingly important habitat.

Many wildlife species find the surface karst features and the stable environment and shelter provided within the caves to be valuable habitat. Caves have been used as natal den sites for otters, and as resting and denning sites for deer, bear, wolves, and small furbearers. Deer are known to rest around cave entrances both in summer, when the air coming from the caves is cooler, and in winter, when the cave entrance environment is warmer than elsewhere. Some bird species, including dippers, thrushes, and swallows, are known to use cave entrances for nesting and feeding. Rookeries for seabirds have been found in some littoral (sea coast) caves. Cave systems provide habitat for many invertebrate organisms and an extensive inventory of invertebrate species is underway.

Cave systems are known to provide critical summer and winter roosting and hibernating habitat for bats. Bats select cave sites because they fulfill very specific requirements involving cave structure, air circulation patterns, temperature profiles, humidity, and location relative to feeding sites. Southeast Alaska caves appear to be most important to bats during periods of winter torpor. No use of caves by bats as summer roosts or maternity colonies has been noted as yet. Considerable work remains before a good understanding of the year-around importance of caves to bats is understood.

Preliminary studies suggest that aquatic habitats associated with karst landscapes may be 8-10 times more productive than adjacent non-karst aquatic habitats. Karst aquatic habitats support a greater abundance, distribution, density, and variety of invertebrate species than non-carbonate habitats, have higher growth rates for smolts and resident fish, reflect less variable water temperatures and flow regimes, and contain unique habitat affecting species distribution, abundance, and adaptation.

The potential cultural and paleontological significance of the caves and karst landscape is high. The Pleistocene paleontology of the area is primarily known from cave and rock shelter deposits, which are often intimately related to archaeological sites. The cool, stable, non-acid environments in the caves result in exceptionally good preservation of bone and organic materials. To date, significant archaeological and paleontological materials have been discovered in over thirty caves and rock shelters within the Ketchikan Area of the Tongass. Evidence of human habitation, the oldest dating to nearly 4,500 years before present (B.P.), has been discovered in several caves on Prince of Wales and nearby seaward islands. Four black bears (*Ursus americanus*), one of which dates to approximately 11,565 years B.P., and sixteen grizzly or brown bears (*Ursus arctos*), ranging in age from 35,363 to 7,205 years B.P. and now extinct on Prince of Wales Island, have been discovered. A possible black bear tibia has been dated to older than 39,100 B.P.

Aerial and on-the-ground observations are revealing the effects of past resource management on karst systems. Hydrologic evidence suggests that timber harvest increases the amount and changes the timing of peak surface flow, resulting in accelerated sediment and debris transport. Passages have flooded which had not flooded for centuries, and many cave entrances are infilled and/or blocked by logging slash, sediment, and debris, resulting in surface flows being re-routed into different passages. In the past runoff generated from road surfaces commonly is diverted into karst features. It is not known what cumulative effects past timber harvest has had on the epikarst landscape.

In some portions of the Ketchikan Area, 70 to 80 percent of the commercial forest land within specific karst blocks has been harvested. It is estimated that about 50 percent of the karstlands below 1,400 feet in elevation and on slopes less than 60 percent in the Thorne Bay Ranger District have been harvested (based on the GIS database).

On the low to moderate vulnerability karst lands were mineral or glacially-derived soils fully or partially cover the epikarst, forest regeneration is exceptional. In these areas even the complete loss of soil and litter from the surface of the limestone will not prohibit the re-establishment of a forest, since the displaced surface materials are retained within the epikarst channels (Harding and Ford 1993). Inclusions within these areas, such as sharp karst knobs, steep slopes, and areas of intense karst development, have had problems regenerating or now support stunted, chlorotic vegetation. On highly sensitive karst lands the epikarst channels are too deep to allow conifer seedlings to establish themselves even if the displaced soil is retained. The bottom of the channels may also be open, directly transporting sediment and debris into the karst groundwater system. Highly sensitive or vulnerable karst areas are generally found at higher elevations, have very thin organic soils which are easily displaced, are on steeper slopes, or are in areas of intense karst development. Previous harvest in such areas has resulted in an increase in the percentage of bare rock, and in less-than-desirable forest regeneration.

Although most caves found to date on the Tongass are not suitable for recreation purposes because of frequent flooding, instability or presence of fragile structures, the Forest Service is seeking opportunities for surface and subsurface public access and interpretation.

Environmental Consequences

There are three options for managing caves and karst areas in the alternatives. Current direction (Alternative 9) extends only to the protection of designated significant caves under the Federal Cave Resource Protection Act. Alternatives 2, 7 and 8 use standards and guidelines from the unpublished 1992 FEIS for caves. These standards and guidelines include a process for compiling an inventory of significant caves, measures to take in protecting all known significant caves, and some recognition of the connection between karst geology and caves.

The third approach to cave and karst management is designed to assess the vulnerability or sensitivity of karst areas to planned resource activities. This strategy strives to maintain the natural karst processes and the productivity of the karst landscape while providing for other resource uses where appropriate. The karst vulnerability strategy is outlined in detail in the Karst and Cave Resources Forest-wide Standards and Guidelines (Proposed Revised Forest Plan, Chapter 4). These are applied in Alternatives 1, 3, 4, 5 and 6. A protocol for accessing vulnerability levels is presented in Appendix I of the Proposed Revised Forest Plan.

Under this strategy, project planning will first identify all potentially affected karst lands and features, and the extent of their hydrologic systems. Karst areas would then be rated in terms of their vulnerability to the proposed management activities. Low vulnerability areas would not require any special management. High vulnerability areas would be removed from the suitable timber base (if the project is to harvest timber), or otherwise avoided. In moderate vulnerability areas, activities would be allowed, but with some restrictions on practices or project design.

All alternatives include, at a minimum, direction for protecting significant caves under the Caves Act, and no significant adverse effects to those caves are anticipated under any alternative. However, alternatives 2, 7, 8 and 9 do not include the Karst and Cave Resources standards and guidelines. In these alternatives, karst features and systems that go beyond the extent of associated significant caves are not covered by Forest Plan direction. In moderate and high vulnerability karst areas, if management activities such as timber harvesting occur, adverse effects such as those described above under Affected Environment are likely. In these areas, over time, karst ecosystems and processes could be significantly adversely affected, with the potential reduction or loss of fish, wildlife and plant habitats, and the destruction of unknown but possibly significant archaeological and paleontological resources.

The current inventory of known karst areas can be used to estimate the potential risk to karst resources from the alternatives, in particular those not adopting the Karst and Cave Resources standards and guidelines. Table 3-24 shows the acres of inventoried karst areas, and those that are suitable timber lands, that are included within the Moderate and Intensive Development LUD groups by alternative. Since even with application of the standards and guidelines there is some risk of affecting unidentified karst areas, Alternative 1 among those using the standards and guidelines has the lowest risk. Among those alternatives not adopting the Karst and Cave Resources standards and guidelines, Alternatives 7 and 9 pose the greatest risk to karst ecosystems across the Tongass, each with about 75 percent of the inventoried karst area of 479,000 acres available for timber harvest. Alternatives 2, 4 and 8 include about two-thirds of inventoried Karst in these LUD groups, and Alternatives 3, 5 and 6 roughly 50 percent. Alternatives 2 and 8 also do not adopt the karst and cave resources standards and guidelines

Table 3-24
Inventoried karst area within Moderate and Intensive Development LUD groups by alternative

Alternative	Total Inventoried Karst Areas	Portion that is Tentatively Suitable Timber Lands
1	6,183	3,321
2	316,753	160,574
3	258,870	129,086
4	316,753	160,453
5	238,136	143,617
6	238,136	143,617
7	268,832	191,543
8	297,653	127,264
9	356,021	188,665

Source: Query Qkarstrx.

Lands

Affected Environment

The Lands category includes non-recreation special uses, land ownership administration and adjustments, and transportation and utility systems. Most non-recreation special uses (roughly 500 are under authorization in any given year) are industrial uses such as commercial fishing camps, transportation facilities, and electronic sites.

Land ownership within the Tongass National Forest is complicated by several on-going land selection processes. The Alaska Statehood Act of 1959 authorized the State of Alaska to select 400,000 acres of vacant and unappropriated land from within National Forests in Alaska, for furthering the development and expansion of Alaskan communities. As of October 1995 the State had received title to approximately 212,400 acres located in the Tongass National Forest. The State has completed its National Forest selection process, and most of the land requested by the State has been approved by the Forest Service. Approximately 104,000 acres remain to be conveyed from the Chugach and Tongass National Forests.

The Alaska Native Claims Settlement Act of 1971 (ANCSA) provided for conveyance of 23,040 acres of land to each of the ten Native village corporations and two urban corporations located in Southeast Alaska, additional acres to the Regional corporation (Sealaska), and up to 160 acres to Native individuals who had occupied that land as a primary place of residence on August 31, 1971. As of October 1995 approximately 544,400 of a total of approximately 560,700 acres had been conveyed. The Alaska Native Allotment Act of 1906 provided for Native individuals who had occupied lands prior to their designation as National Forest to apply for conveyance of up to 160 acres, under conditions prescribed by the Act and Federal Regulations. As of October 1995, 2,014 acres in 37 Native allotments had been conveyed, with an additional 7,914 acres pending adjudication by the Bureau of Land Management.

“Transportation and utility systems” are major rights-of-way corridors and their associated sites. These systems include State and Federal highways, powerlines of 66 kV capacity or greater, and pipelines 10 inches or more in diameter if they are a public utility. The Forest Plan Revision includes a Transportation and Utility Systems Land Use Designation (LUD) which can be applied to these potential corridors. With certain exceptions transportation and utility systems are allowed throughout the Tongass, as directed by Title XI of ANILCA.

Environmental Consequences

There are no significant environmental consequences within the Lands category anticipated for any of the alternatives. Minor changes to the National Forest land base may continue to occur as a result of the ongoing conveyance processes, or from future land exchanges. An adjustment to the suitable timber land base has been made for each alternative for lands anticipated to be conveyed in the future (“encumbered”). The future addition of electronic sites by private industry could help improve electronic signal coverage Forest-wide.

Major transportation and utility systems can reduce scenic quality while at the same time increasing recreational access, and may affect other resources. Each proposed land use designation is identified as being either an “avoidance area” or a “window” for the location of these systems. Windows represent areas of no conflict between desired LUD uses and the designation of a transportation or utility corridor or site. Avoidance areas represent LUD’s where such a designation would not be desirable. While no LUD precludes the designation of a corridor or site, the idea is to locate them within a window where possible. Alternatives with more acres in “windows” would thus make this location easier. The differences in window and avoidance area acres between the alternatives are not considered significant effects.

Use of the Transportation and Utility Systems LUD will help reduce potential conflicts in the event of future development of either major state highways or utility systems (such as transmission lines). This LUD is applied in all alternatives, except Alternatives 1 and 9, to potential highway routes and utility corridors identified in recent studies (see discussion in Transportation section, and the alternative maps). This LUD will function as a “window” as just discussed. Under Alternative 1, and under Alternative 9 but considerably less so, the future development of many of these routes or systems could be subject to more stringent environmental standards, particularly for scenic quality, and could therefore be costlier than under the other alternatives.

Minerals

Affected Environment

The 1991 SDEIS contains an in-depth description of the mineral resources of the Tongass, including their historical development and current estimated supply. That information is briefly summarized here. The 1991 SDEIS was in error in the estimation of molybdenum reserves for Quartz Hill; this has been corrected, and updated calculations of amount and value for Quartz Hill are contained in the planning record.

A wide variety of mineral deposit types and mineral resources occur within the boundaries of the Tongass National Forest. Examples of some of these mineral resources are gold, silver, molybdenum, and uranium, and nationally-designated "strategic" and "critical" minerals such as lead, zinc, copper, tungsten and platinum group metals. The Forest Service recognizes that minerals are fundamental to the Nation's well being and, as policy, encourages the exploration and development of the mineral resources it manages. The Secretary of Agriculture has provided regulations (36 CFR 228) to ensure surface resource protection, while encouraging the orderly development of mineral resources on National Forest System lands.

Mineral resources are legally divided into three groups: locatable minerals, leasable minerals, and salable minerals. The authority of the Forest Service to influence and regulate the exploration, development, and production phases of mining operations varies with each group. As a result, the Forest Service manages mineral resource programs that are specific to each group of minerals.

Locatable Minerals

A locatable mineral is any mineral which is "valuable" in the usual economic sense, or has a property that gives it distinct and special value. Examples of some locatable minerals on the Tongass National Forest are gold, silver, copper, molybdenum, iron, nickel, lead, zinc, limestone, and marble.

The locatable mineral resource includes both identified and undiscovered reserves. The gross metal value of identified mineral resources within the boundaries of the Tongass National Forest was estimated by the U.S. Bureau of Mines. In 1990, this value was $37.1 billion dollars (expressed as 1988 dollars). Highest among the individual minerals were molybdenum ($14.4 billion) and iron ($12.7 billion), with gold third at $2.26 billion. The gross metal value of undiscovered mineral resources was estimated for the Tongass National Forest by the U.S. Geological Survey (Brew, 1990). In 1990, this value was $28.3 billion dollars (expressed as 1988 dollars). Highest among the individual minerals were copper ($6.8 billion), iron ($4.6 billion), molybdenum ($4.35 billion), and tin ($3.4 billion). These totals cover the entire Tongass, and thus include areas currently withdrawn from mineral entry, such as wilderness.

Demand for mineral resources can be inferred based on the amount of money spent by the mining industry to prospect and explore for mineral resources in Southeast Alaska. Increases in the amount of money spent on exploration reflect an increase in demand for mineral resources. Between 1982 and 1987, the mineral industry spent an average of $2.92 million per year on mineral exploration in Southeast Alaska, with a high of $5.85 million in 1987. Between 1988 and 1991, the industry spent over $20 million each year. Expenditures for the last three years were: 1992 - $14.86 million; 1993 - $15.67 million; 1994 - $9.8 million (Alaska Department of Natural Resources, "Alaska's Mineral Industry" annual summaries).

Demand for mineral resources can also be inferred by modeling the economic viability of identified mineral resources. Identified mineral resources with high degrees of economic viability will reflect an increase in mineral-related activities or in demand for those resources by industry. The economic viability of 148 mineral deposits located within the boundaries of the Tongass National Forest were modeled by the U.S. Bureau of Mines (Coldwell 1990). Fifty-two mineral activity tracts covering 605,854 surface acres were classified as having a high potential for experiencing mineral exploration or development activity during the next 10 to 15 years. Based on economic and other criteria, 23 of these were identified as most likely (or of highest "priority") to be developed, and 12 were identified as likely to provide a positive rate of return in 1990.

Leasable Mineral

Federally-owned leasable minerals include oil, gas, coal, geothermal resources, potassium, sodium, phosphates and sulfur. These minerals are subject to exploration and development under leases, permits, or licenses. The authority to manage these minerals is presently administered by the U.S. Department of Interior, Bureau of Land Management in cooperation with the Forest Service. The resource potential for oil and gas is considered to be moderate to low in the Yakutat region (with no potential elsewhere in the Tongass). Coal occurrences are classified as lignite and of small extent. Geothermal resources occur in 19 known locations in Southeast Alaska. No leasable minerals are presently being produced on the Tongass National Forest, and the anticipated demand is expected to remain quite low.

Salable Minerals

Salable, or "common variety," minerals are sold rather than located or leased. These minerals include petrified wood and common varieties of sand, rock, building stone, gravel, pumice, clay, and other similar materials. Such common variety mineral materials include deposits which, although they have economic value, are used for agriculture, as building materials, for cleaners and abrasives, etc. The predominant salable commodity extracted on the Tongass National Forest is crushed rock used to construct timber sale roads. The supply of quality rock sources is largely dependent upon the locations of active logging operations. Presently, there is an adequate supply of rock sources with suitable quality (hardness and durability) in the Ketchikan Area. However, rock quality is poor in the Chatham and Stikine Areas and good material sources are difficult to locate in current timber production areas. Sand and gravel sources are scarce throughout the Forest except within the Yakutat Ranger District.

All roads built in the Tongass require rock for construction because the subgrade soils have poor strength characteristics. The demand for rock will closely follow the need to construct new timber sale roads. The total in-service use of rock for existing roads was 43,962,500 cubic yards, used to construct 3,355 miles of road. As the use of forest roads increases, and both the Alaska State Department of Transportation and the Federal Highways Department assume responsibility for road maintenance, the demand for crushed rock will increase. It will be expensive to locate sites with suitable quality and quantity in the northern part of the Forest, and haul distances will increase. As land exchanges continue, new communities and existing communities will require mineral materials for development of roads, and for foundations for homes, schools and other buildings. The demand for rock from public land in support of these growing communities will also increase.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Locatable Minerals

Under any alternative, future exploration and development (except for valid, currently existing rights) would be precluded in areas withdrawn from mineral entry, such as Wilderness. The availability of mineral resources of the Tongass National Forest may also be affected by the allocation of other land use designations in each alternative, and the use of Forest-wide standards and guidelines during project implementation. The standards and guidelines of certain land use designations could affect the cost of conducting exploration, development, and reclamation activities, and thus influence the exploration of some areas for their mineral resources.

Most withdrawn lands are designated so by the U.S. Congress (i.e., Wilderness withdrawals). On other National Forest System lands, the Forest Service does not have the authority to approve or disapprove most mineral operations (the exception being salable minerals), but can recommend stipulations on how mineral resources are developed. Thus, the potential effects of alternatives on mineral resources can be estimated by analyzing the relative degree to which land use designations and their associated prescriptions could economically constrain proposed mineral activities.

The 1991 SDEIS used three categories of land use designations: withdrawn areas (which assume higher costs for the development of valid existing rights), and two "open" categories, one with higher costs and one with average costs. Open areas with higher costs generally correspond to non-withdrawn areas in the Natural Setting LUD group, while open areas with average costs correspond to those areas within the Moderate and Intensive Development LUD groups. Using the Forest-wide acreage breakdowns of LUD groups by alternative (see Table 3-1) gives the overall effects on economic availability of mineral resources. Wilderness and National Monument acres remain the same for all alternatives; a few additional withdrawals could occur for recommended Wild Rivers, individual Research Natural or Special Interest Areas, and high vulnerability karst areas.

Locatable minerals are divided into identified resources and undiscovered resources. Only the 52 mineral activity tracts were considered for allocation to the Minerals LUD. Alternatives 1 and 9 did not use the Minerals LUD. Alternatives 2-6 allocate this LUD to the 12 mineral activity tracts that appear to be most economic to develop. Alternatives 7 and 8 apply the Minerals LUD to all 23 of the "high priority" tracts. The primary effect of this LUD would be to allow development at "average" operating costs, regardless of the underlying land use designation. Each alternative also recommends additional areas that could become withdrawn.

The 1991 SDEIS analyzed effects on the identified mineral resources (the areas in the 52 mineral activity tracts), and on the undiscovered mineral resources. The effects displayed therein can be carried forward in a general way for making relative comparisons of the present set of alternatives, with Alternative A roughly corresponding to Alternative 1, Alternative C corresponding to Alternative 9, Alternative D to Alternatives 8 and 9, and Alternative P to Alternatives 2-6. The main difference is that for alternatives with added old-growth reserves (Alternatives 3, 5, 6 and 8), some average-cost areas could shift into the higher-cost category.

Table 3-25 shows this relative comparison for the areas with identified mineral resources. The Current Plan (Alternative 9) has the fewest acres of identified mineral resources in allocations potentially causing higher costs for their exploration and development, and Alternative 1 the most. The differences between Alternatives 2 through 8 are not significant.

Table 3-25
Effects on economic availability of identified mineral resources, shown as a percent of the 604,989 acre total

	Withdrawn Areas		Open Areas	
	Existing	Recommended	Higher Cost	Average Cost
Alternative 1	23.6%	1.9%	53.2%	21.3%
Alternatives 2-6	23.6%	0.5%	39.7%	36.2%
Alternatives 7-8	23.6%	0.0%	37.9%	38.6%
Alternative 9	23.6%	0.0%	24.2%	52.2%

Based on 1991 SDEIS

A similar analysis for the 6.66 million acres of undiscovered mineral resources is shown in Table 3-26 below. Here only Alternative 1 appears to differ significantly from the other alternatives, having more acres in allocations potentially causing higher costs.

Table 3-26
Effects on economic availability of undiscovered mineral resources, shown as a percent of the 6.66 million acre total

	Withdrawn Areas		Open Areas	
	Existing	Recommended	Higher Cost	Average Cost
Alternative 1	33.8%	1.8%	45.9%	18.5%
Alternatives 2-6	33.8%	0.8%	35.1%	30.3%
Alternatives 7-8	33.8%	0.3%	34.9%	31.0%
Alternative 9	33.8%	0.4%	32.7%	33.1%

Based on 1991 SDEIS

The 1991 SDEIS also estimated the possible costs, in terms of unrealized mineral values, of the additional recommended (or potential) withdrawals by alternative. These are shown in Table 3-27 below (using the same alternative correspondences as used above).

Table 3-27
Unrealized values (in millions) due to potential withdrawals of identified or undiscovered mineral resources by alternative

	Alternatives 1	2-6	7-8	9
Identified	$705.0	$0.0	$37.0	$0.0
Undiscovered	$830.9	$197.3	$247.9	$194.1
Combined	$1,535.9	$197.3	$284.9	$194.1

Based on 1991 SDEIS

Leasable and Salable Minerals

The effects of alternatives on leasable minerals are not discussed. The Tongass has no current leasable mineral activity and none is projected. Salable or common variety minerals, primarily crushed rock, are utilized in each of the alternatives. Their predominant use is to construct roads in support of the Tongass National Forest transportation system, and thus the amounts used will correspond closely to the miles of new road construction by alternative. These are shown in Chapter 2 and in the Transportation section of this chapter.

Recreation and Tourism

Affected Environment

Recreation

Southeast Alaska, of which the Tongass National Forest makes up about 80 percent, possesses a remarkable and unique combination of features, including inland waterways with over 11,000 miles of shoreline, mountains, fiords, glaciers, and large or unusual fish and wildlife populations, that provide opportunities for a wide range of excellent outdoor recreation experiences. Many of these opportunities cannot be duplicated elsewhere in North America, or most other places in the world. Southeast Alaska imparts a feeling of vastness, wildness, and solitude. These feelings are enhanced by the small resident population and relative absence of development compared to most other National Forests.

Especially on the Tongass National Forest, where most recreation attractions and much of the use occurs in remote, undeveloped areas, understanding the inherent values of recreation settings and their attributes and attractions is critical. Many Alaska residents purposefully live in proximity to such settings as a part of their lifestyle. Most visitors, who travel long distances to see Alaska, expect to find it "wild and unspoiled," while at the same time seek comfort and convenience, reliable transportation and other features requiring some level of infrastructure and development. The challenge to managers is to identify and understand the relationship between the settings and the variety of client groups that are seeking opportunities to participate in a wide variety of activities. Commercial providers of recreation activities base much of their marketing strategy on particular environmental settings and identified recreation places within those settings.

The Recreation Opportunity Spectrum (ROS) has been developed to help identify, quantify, and describe forest recreation settings. The ROS system portrays the appropriate combination of activities, settings, and experience expectations along a continuum which ranges from primitive to highly modified environments. Seven classifications are made along this continuum, based largely on a particular area's naturalness, remoteness, accessibility, and degree of development. The names of these ROS classes are generally indicative of their character: primitive, semi-primitive non-motorized, semi-primitive motorized, roaded natural, roaded modified, rural, and urban. The 1991 SDEIS includes a detailed description of each ROS class (they are also defined in the Glossary).

A general Forest-wide inventory of the ROS classification was made in 1989, and is periodically updated. Table 3-28 gives the current Forest-wide acreages. This baseline will be used to measure anticipated changes to the settings that could result from alternative allocations.

Table 3-28
Recreation Opportunity Spectrum (ROS acres)

ROS Class	Acres
Primitive	11,010,165
Semi-Primitive Non-Motorized	3,169,772
Semi-Primitive Motorized	1,187,481
Roaded Natural	190,894
Roaded Modified	1,372,944
Rural	6,724
Urban	759

Source: Revision database

These large acreages are impressive, and contribute greatly to the feeling of vastness and solitude so predominant throughout Southeast Alaska; but the amount of land area actually available and usable for outdoor recreation purposes is generally much less. The difficult and steep terrain, wetlands, ice fields and glaciers, and heavy vegetation confine most of the recreation activities to the accessible shorelines, river and stream bottoms, and around the many lakes within the Forest. Some use is made of certain parts of the ice fields and alpine areas, but access is usually by aircraft. Near communities, residents and visitors alike use the developed camp and picnic grounds, beaches, and visitor centers, but concentrated use areas and facilities, such as visitor centers and campgrounds, in the vicinity of communities are the exception. Viewing scenery and wildlife, boating, fishing, beachcombing, hiking, and hunting are the principal dispersed recreation activities participated in by resident users. Access plays a key role in the nature of how the outdoor recreation resource is used.

Access is typically by boat, or by vehicle on community road systems. The use of aircraft for access is a third type, but is limited by the number of people that can be carried and the cost. The pattern of use associated with known protected boat anchorages, boat landings, aircraft landing sites, and the limited road systems, makes it possible to identify specific "recreation places." Recreation places are those areas that are easy to access and that are used for recreation activities. It is these specific places, and the quality of the settings associated with them, that constitute the effective supply of recreation opportunities throughout the Tongass National Forest.

In order to understand the recreation resource, as well as the effects of other management activities on the recreation setting, these specific geographic areas with recreation value have been inventoried. Over 1,400 recreation places, totaling approximately 3.6 million acres, have been identified (see “Recreation Places Inventory” map in map packet). Table 3-29 displays a further breakdown. An attempt has also been made to identify the capacity of these recreation places, and this is also displayed in the table. Capacity is related to ROS setting. For instance, primitive settings have the ability to provide greater opportunities for solitude and remoteness, but doing so requires larger areas and fewer people, and thus the capacity of these areas is relatively low. Conversely, roaded settings can provide opportunities for concentrated use, such as picnicking and developed site camping, and thus have higher capacities. The capacities shown estimate the maximum number of Recreation Visitor Days per year possible (1 RVD = 12 hours of recreation use by one person) while still providing a similar experience.

Table 3-29
Tongass-wide summary of recreation places.

	Number of places	Acres	Capacity (RVD's/year)
Inside Wilderness	311	1,275,596	889,451
Outside Wilderness	1,159	2,351,188	4,052,661
Tongass-wide Total	1,436[1]	3,626,784	4,942,112

Source: Revision database
[1]Some individual places span Wilderness and non-Wilderness, thus the total is less than the sum.

As previously indicated, the setting of these recreation places plays a key role in their attractiveness and utility. Many recreation opportunities are dependent on this relationship, and those such as viewing scenery or pursuing solitude require a natural type of setting. Other activities may not be directly dependent on the setting, such as hunting and fishing. Using the ROS inventory, the present setting of recreation places is displayed in Table 3-30.

Table 3-30
Recreation Opportunity Spectrum class summary for recreation place acres.

ROS Class	Acres
Primitive	1,574,142
Semi-Primitive Non-Motorized	895,626
Semi-Primitive Motorized	705,774
Roaded Natural	122,559
Roaded Modified	324,361
Rural	3,963
Urban	360

Source: Revision database

Recreation places can be categorized into three general groupings according to their principal uses and attraction: marine, freshwater, and land-based. The marine setting is the most predominant of the three. The unique setting that makes the Tongass different from other National Forests is that of an island and marine environment in close association with major mountain ranges and ice fields. The marine interface, connecting the sea with the land, is the most accessible and most sought-after setting for recreation opportunities; but it is also limited relative to land-based opportunities. Thirty-nine percent of the identified recreation place acres are primarily related to marine recreation. The majority of use originates in local community boat harbors or launching sites accessed by road systems - the family boat is used in the same manner as wheeled recreational vehicles are used in locations with access to roads.

The Tongass also abounds in freshwater recreation opportunities. There are more than 45,000 miles of perennial streams and rivers and over 20,000 lakes and ponds within the Forest. Twenty-nine percent of the identified recreation place acres are primarily related to freshwater recreation, including fishing; 81 of the 145 recreation cabins and shelters of the Tongass are located on or near freshwater lakes or streams.

The remaining 32 percent of identified recreation place acres are primarily related to land-based recreation opportunities. The effective capacity of these areas is generally low. While some recreation use occurs in all land areas (including forest, muskeg, and glacier), the use is highest where access is more available. The most popular activities of users of the identified land-related recreation places are hunting, hiking (where there are trails), and driving for pleasure (where there are roads).

Included within recreation places are developed recreation sites. These are campgrounds, picnic sites, trails, interpretive sites, and cabins which provide for concentrated visitor use. These facilities, with the exception of cabins and many trails, are generally accessible from community road systems. Facilities such as campgrounds, visitor centers, and picnic sites will be managed to continue providing the existing setting attributes, while facilities such as trails and cabins may be subject to setting changes in the future. Several important recreation complexes provide a variety of recreation opportunities and are generally accessible from population centers. Many provide a natural setting that includes a key attraction, such as a glacier or lake (examples are Mendenhall Glacier and Ward Lake).

Non-consumptive uses of wildlife (i.e., wildlife viewing) have become increasingly important to the lifestyle and the economy of Southeast Alaska, yet little is specifically known about important use areas, target species, the kinds and amounts of other uses that may compliment or conflict with these uses, or the effects if any on the wildlife species involved. The 1991 SDEIS summarizes the known information.

Tourism

The relationship between tourism (generally visitors from outside Southeast Alaska visiting Southeast) and outdoor recreation use by local residents is somewhat different than on many National Forests that are connected to the rest of the Continent by conventional highway systems. The majority of tourism use is associated with the cruise ships and ferries that travel Southeast Alaska's inside passage and stop primarily only at the larger communities. For the majority of tourists their major experience of the Tongass National Forest is in seeing it from the water, and many only set foot on land in towns and communities. Flightseeing operations, smaller tour boats, and some outfitters depend largely on these cruise ship and ferry visitors for their clientele.

Over the last decade (1985 to 1994) cruiseship use within Southeast Alaska increased 172 percent, rising almost every year to a high of 372,923 passengers in 1994. Ferry system use for the same time period fluctuated somewhat, averaging over 340,000 passengers per year, with a high of 372,680 passengers in 1992. And airline use (enplaning at Juneau) showed an overall increase of 40 percent, to 229,820 passengers in 1994. (All data based on an update of information in the 1991 SDEIS). It can be assumed that essentially all cruiseship use is by non-resident tourists, but it is not possible to separate out ferry and airline use between Southeast Alaska residents and non-residents.

Tourists, or non-resident recreationists, can be broadly categorized into two major groups: the independent visitor and the package visitor. The independent visitor constitutes a small, but growing, group, characterized as those who get off the ferries and planes and engage in a variety of activities. They spend more time in the communities and on the Forest, and may secure the services of outfitters and guides, motels, and transportation services such as floatplanes, boats, and gas stations. Package visitors include cruiseship clients, and some who arrive by ferry or airplane. These visitors spend less time in the area, and often follow pre-planned itineraries. This large group uses the Tongass primarily as a scenic resource. Although excursions into the Forest are increasing, they are mostly oriented around boat trips and flightseeing, using the Forest as a scenic backdrop.

Important tourism areas are identified in the recreation place inventory. Of all identified recreation places, 42 percent are important for tourism; and 61 percent of recreation place acres are important for tourism. This indicates that tourism uses require larger areas on-the-average than do resident recreation uses, and reflects the scenic and excursion aspects of tourism previously discussed.

The marketing of recreation opportunities by commercial suppliers has important similarities to resident recreation concerns. For example, businesses which provide boat or aircraft access for wildlife viewing and other activities have a low tolerance for the presence of other groups in the same area. The presence of more than two or three other parties in a bay or area may cause such operators to seek substitute locations. The ability to market Alaska tourism, in part due to the high cost of visiting Alaska, is dependent on meeting customer expectations of seeing and experiencing a vast, awe-inspiring, "untamed" land and its wildlife. Conversely, these commercial uses can conflict with use by local residents.

Tourism is a highly seasonal activity, even more so than local recreation. Most tourist visitation is directly related to the cruiseship schedules; late May through late September is the typical season, with most arrivals in July and August. This has been a concern for the state and the industry, which has been exploring ways to increase use of the spring and fall "shoulder" seasons, and even to increase winter visits at specific locations.

In the foreseeable future, cruiseships are expected to continue to dominate tourism uses in Southeast Alaska. Independent markets are growing, however, and the excursion industry, flightseeing, and "eco-tourism" (including wildlife viewing) are all expected to expand.

The Forest has the ability to provide an indefinite capacity for recreation opportunities such as sightseeing, which can take place off National Forest land but for which the Forest setting is the primary focus. These activities normally do not affect the recreation place capacity. The cruiseship industry is a prime example. Viewing scenery is a major attraction in Alaska, and is increasing in Southeast. It makes little difference whether one ship or ten ships pass through the Forest on the inland waterways: the limiting factors are the docking capacity of the communities, economics and marketing, and logistical concerns such as the number of inland excursions and tours available. Recently it appears that another limiting factor may be the tolerance of local residents for tourism activities. Flightseeing is another example of a use that does not directly affect recreation place capacity, although some impacts from flightseeing, such as noise, may affect whether other people choose to use certain recreation places.

Environmental Consequences

Recreation

Most alternatives have, to varying degrees, the potential to significantly affect the physical and/or social character of identified recreation places within the Forest. Implementing the integrated management direction contained in the LUD prescriptions and Forest-wide standards and guidelines will minimize effects to many recreation places, but some may not be preserved in their current condition under some land use designations. The following analysis, which except for an expanded discussion of tourism effects summarizes and updates that in the 1991 SDEIS, describes consequences to the recreation resource in terms of changes in Recreation Opportunity Spectrum classes, recreation place settings, highly valued recreation places, and tourism opportunities. The analysis by individual community "home ranges" from the 1991 SDEIS has not been updated.

The mix of recreation opportunity settings will vary by alternative. ROS is an inventory tool, a result of many factors which can change over time. Knowing site-specific changes, ROS can be used as a predictive tool to describe future setting opportunities. Given the programmatic nature of this planning document, it is not possible to predict the actual changes that would occur from implementing any given alternatives, but only to indicate those that could occur given the kinds of activities allowed within particular LUD's.

Some setting assumptions can thus be made for the various land use designations, realizing that site-specific exceptions may occur. For instance, an area identified for timber production will likely change to a Roaded Modified setting, but may not, due to lack of suitable timber, topographic features, or the absence of specific projects; or, only part of an area may be altered, with the rest maintaining its original setting.

In comparing the alternatives based on Forest-wide changes in ROS (Table 3-31), keep in mind that these are long-term changes that in most cases will occur gradually over several decades; these predicted ROS class acres would occur after 150 years of alternative implementation. The alternative breakdowns are estimated based on the types of land alterations allowed by particular land use designations. Alternative 1 shows very little change (on a percentage basis) from the current (1995) ROS class distribution for the Tongass. The most noticeable change for all other alternatives is a considerable increase in roaded modified opportunities, and a corresponding decrease in primitive and semi-primitive opportunities. In an absolute sense, acreages in the primitive ROS class (currently 65 percent of Tongass acres) decrease the most over time: roughly 2 million acres in Alternatives 2-6, 2.2 million in Alternative 8, 2.8 in Alternative 9, and 3.7 in Alternative 7. These represent declines in primitive acres ranging from 2 percent (Alternative 1) to 34 percent (Alternative 7). Semi-primitive nonmotorized acres decline 29-65 percent (from current level of about 3.17 million), and semi-primitive motorized 0-55 percent (from a current level of about 1.19 million), again and in both cases Alternative 1 showing the least declines, Alternative 7 the most.

Essentially all the increases (the roaded natural class does increase, but by at the most 250,000 acres) are in the roaded modified category. From a current level of 1.37 million acres (8 percent of the Tongass), this category increases by 215 percent in Alternative 3 on up to 460 percent in Alternative 7 (this excludes Alternative 1, which increases 100,000 acres, or 7 percent). Approximate acreage increases are: Alternative 3 - 2.95 million; Alternative 5 and 6 - 3.41 million; Alternative 2 and 4 - 3.71 million; Alternative 8 - 3.79 million; Alternative 9 - 4.64 million; and Alternative 7 - 6.32 million. Ranking alternatives based on the overall projected change from the more "undeveloped" ROS classes (or recreation opportunities) to the more developed, Alternative 1 changes the least, followed by Alternatives 3, 5 or 6, 2 or 4, 8, 9 and 7.

Table 3-31
Forest-wide Recreation Opportunity Spectrum (ROS) acres (in 1,000's), and percents by alternative after 150 years of plan implentation [1]

ROS Class [2]	1995	Alternatives 1	2	3	4	5	6	7	8	9
P	11,010	10,711	8,975	9,094	8,975	9,020	9,020	7,293	8,755	8,243
	65%	63%	53%	54%	53%	53%	53%	43%	52%	49%
SPNM	3,170	3,276	1,736	2,246	1,736	1,939	1,939	1,109	1,957	1,575
	19%	19%	10%	13%	10%	11%	11%	7%	11%	9%
SPM	1,187	1,184	736	841	736	773	773	534	754	660
	7%	7%	4%	5%	4%	5%	5%	3%	5%	4%
RN	191	286	404	428	404	419	419	302	302	436
	1%	2%	2%	3%	2%	3%	3%	2%	2%	3%
RM	1,373	1,473	5,080	4,323	5,080	4,780	4,780	7,694	5,163	6,017
	8%	8%	30%	25%	30%	28%	28%	45%	30%	35%
R, U	7	7	7	7	7	7	7	7	7	7
	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%

[1] Acres are rounded to the nearest thousand. All percents are percents of total Forest acres (16,939 million). Rural and Urban ROS have been combined, and represent less than one percent of total acres in all alternatives.
[2] P = Primitive; SPNM = Semi-primitive Non-motorized; SPM = Semi-primitive Motorized; RN = Roaded Natural; RM = Roaded Modified; R = Rural; U = Urban

Changes in the character of the recreation place settings are described in terms of the land use designation groups, rather than recreation opportunity spectrum classes, due to the site-specific nature of recreation places. Recreation places are specifically addressed in the LUD prescriptions and Forest-wide standards and guidelines, which will assist in maintaining the character of their settings. To determine the impact or degree of change for a specific recreation place, one must use the alternative map to determine which land use designation the area falls within, and then refer to the prescription for that LUD.

In addition to potential changes in the recreation places, the view from the recreation place is often important. Most of the identified recreation places are identified as a Visual Priority Travel Route and Use Area for which special management of the scenery will be required. Refer to the Scenery section in this chapter and the Proposed Revised Forest Plan.

To simplify this in discussing Forest-wide effects, changes in recreation place settings can be generally indicated in terms of the LUD groups (Wilderness, Natural Setting, Moderate Development, and Intensive Development). All alternatives have the same acreage in the Wilderness group, and beyond that it is the acres in the Natural Setting group that will in most cases be assured of retaining their current setting over time. Moderate and Intensive Development areas are both likely to alter settings as timber harvesting, road construction, and other developments occur, with changes in the Intensive group likely to happen more quickly and over a wider area. Table 3-32 displays the recreation place acres within each LUD group by alternative. This gives an overall idea of the potential changes to recreation place settings that could occur over time. Following this will be an analysis of specific types of recreation places.

A change in a recreation place from a natural setting to a moderate or intensive setting is not necessarily undesirable or a negative effect. Many recreation opportunities require a higher level of development, such as campgrounds and roaded recreation activities, and thus may be viewed as an opportunity to enhance or round out recreation offerings. Some communities may be lacking developed opportunities, while others may be in need of more primitive and semi-primitive opportunities. Even within communities this perspective may differ, as one may find challenge in off-highway vehicle use enhanced by increased development, while another finds challenge in mountaineering enhanced by a more natural setting. However, given the general nature of current use, marketing techniques for out of state visitors, resident desires, and attractions the Tongass provides, some of the natural setting changes are likely to be seen as negative effects.

At this time, no correlated analysis has been done of how many and what kind of recreation places are included in the corridors of rivers eligible and recommended for inclusion in the National Wild and Scenic Rivers System. Undoubtedly there are numerous recreation places associated with wild and scenic river candidates. In the interim period, before any actual designation, recreation places will be managed to maintain the outstandingly remarkable feature(s) of recommended rivers.

Table 3-32
Forest-wide recreation place acres (in 1,000's), by LUD group by alternative.

LUD	Alternatives								
Group[1]	1	2	3	4	5	6	7	8	9
W	1,316	1,316	1,316	1,316	1,316	1,316	1,316	1,316	1,316
NS	2,425	1,156	1,454	1,156	1,254	1,254	590	1,068	879
MD	11	602	446	602	550	550	277	230	679
ID	10	688	546	688	642	642	1,579	1,148	888

Source: Query Q249C
[1]W = Wilderness; NS = Natural Setting; MD = Moderate Development; ID = Intensive Development.
Acreage totals may not be the same as other tables due to rounding

Recreation places considered most important to local residents are those that are located within a 15-mile radius of communities and their principal road systems. The Forest-wide acreages in these "home range" recreation places are shown in Table 3-33, by LUD group by alternative. Home range recreation places are fully discussed in the 1991 SDEIS; in general, these are the identified recreation places accessible by boat or car for day use. Outlying recreation places may also have special importance to residents or visitors engaging in multi-day trips, and for commercial outfitters, must of whom market the remoteness and solitude of these places.

Table 3-33
Home range recreation place acres (in 1,000's), by LUD group by alternative.

LUD Group[1]	Alternatives 1	2	3	4	5	6	7	8	9
W	427	427	427	427	427	427	427	427	427
NS	1,406	645	829	645	720	720	370	640	510
MD	8	409	316	409	372	372	156	146	433
ID	8	368	277	368	330	330	896	636	478

Source: Query Q3093A
[1] W = Wilderness; NS = Natual Setting; MD = Moderate Development; ID = Intensive Development.

Table 3-34 displays the number of recreation place acres in specific key categories, by LUD group for each alternative. The categories are marine recreation, places with facilities, and places important to hunting and to fishing. These appear to be the most important aspects of recreation places for local residents. (Places important to tourism are displayed and discussed later.) The total recreation place acreages within these categories are: marine recreation - 1.17 million; facilities - 1.21 million; hunting - 1.49 million; and fishing - 0.45 million. Development around a recreation place may be critical to the experience, or have little effect. For instance, a remote public recreation cabin may be enhanced greatly by the solitude and natural scenery the area provides, whereas the attraction of a similar cabin in a different location might be the outstanding steelhead fishing in the spring, or easy access, with the setting being only a secondary factor. To estimate the potential actual effect or degree of change for a specific recreation place, including those under special use permit, one must use the alternative maps to determine which LUD the area falls within, and then refer to the prescription for that LUD in the Proposed Revised Forest Plan.

Comparing the acreages in the following categories with those of recreation places Forest-wide, it can be seen that most alternatives include a higher percentage of these areas in natural settings than for recreation places in general. This attests to the importance of these types of recreation places to Forest users.

Table 3-34
Acreages (in 1,000's) in specific recreation place categories, by LUD group for each alternative.

Rec Place Type and LUD Group[1]	Alternative 1	2	3	4	5	6	7	8	9
Marine Recreation									
W	443	443	443	443	443	443	443	443	443
NS	728	392	474	392	414	414	156	315	260
MD	<1	223	162	223	209	209	106	93	195
ID	2	116	96	116	108	108	468	323	276
Facilities									
W	448	448	448	448	448	448	448	448	448
NS	718	462	575	462	487	487	199	343	343
MD	4	181	132	181	161	161	105	86	231
ID	2	81	66	81	75	75	420	295	150
Hunting									
W	444	444	444	444	444	444	444	444	444
NS	1,040	530	651	530	559	559	299	473	485
MD	7	234	170	234	218	218	188	168	306
ID	7	290	233	290	277	277	567	413	263
Fishing									
W	166	166	166	166	166	166	166	166	166
NS	283	137	186	137	151	151	56	128	87
MD	1	85	58	85	76	76	40	34	116
ID	1	64	41	64	58	58	189	123	83

Source: Query Q3093A
[1] W = Wilderness; NS = Natural Setting; MD = Moderate Development; ID = Intensive Development.

It is important to recognize that the changes just described will not happen all at once. Changes to the recreation resource will generally be incremental over time. Each project proposal will focus on site-specific issues and opportunities. The makeup of forest visitors and the activities they engage in is also likely to change over time. To the extent that forest settings are altered and the recreation places change, new users may be attracted to the Forest, and current forest users will either need to adapt to the new situations, choose new areas within which to recreate, or choose new forms of recreation. As with the changes in settings, these changes too will be gradual and will occur over a relatively long period of time.

Comparing Tables 3-28 and 3-31, it is apparent that the "roaded" ROS classes are the ones that have substantial increases in acreages over time in most alternatives. This is inevitable as long as timber harvesting and other activities requiring additional roading continue. (This is likely to decrease dramatically after several decades, however,.since most road construction will have occured by then.) At the same time, the "unroaded" ROS classes tend to decrease in acreage. Setting changes are generally recognized as a one way street, moving toward the developed or roaded end of the ROS spectrum, although given enough time, settings in Southeast Alaska's rainforest can revert back to semi-primitive conditions. In most alternatives, an over-supply of roaded settings will occur; but at the same time, the Tongass is large enough such that an adequate supply of Primitive and Semi-primitive Non-motorized settings will remain. The problem area is

Semi-primitive Motorized settings, characteristic of the marine interface, which not only decline in acres over time, but which are anticipated to reach capacity within the decade.

As recreation settings change, users may accept the change and continue using the area, or they may move their activities to a more desirable location, which may increase the transportation cost. More tolerant individuals may take the place of those less tolerant.

Tourism

Since much of the tourism "use" of the Tongass actually occurs off of National Forest lands, with the Forest as a backdrop (see Affected Environment discussion), it is difficult to quantify specific effects on tourism. Many affects are related to the scenic resources of the Tongass; these are discussed under Visual Quality. But by examining the mix of LUD allocations of the alternatives, and the Forest-wide standards and guidelines of the Proposed Revised Forest Plan, some general effects and possible trends can be noted.

Some of the factors identified as related to tourism may be at odds with each other. Some industry sectors require developed facilities and easy access, whereas others depend on vast, remote areas in a natural setting. Many segments of the industry require both, offering a combination of stays at developed facilities with easy access to remote areas.

Tourism uses have grown rapidly over the last two decades, at the same time that timber harvesting has continued at relatively high levels. This suggests some insensitivity of tourism in general to Tongass National Forest management activities, although at what point diminishing returns will begin to set in is unknown. There are no studies identifying a "tolerance level" for such activities or the alterations they cause. The analysis here assumes some overall adverse effects as natural settings change to more developed settings. Also, adverse effects have likely occurred at specific locations, such as displacing guide operations requiring solitude and natural settings; and conversely, the expansion of the road system has benefited other operators. These sorts of site-specific tradeoffs are likely to continue under most alternatives.

Under all alternatives, a minimum of about 2/3 of the Tongass will remain in a natural condition. To better quantify the effects of changes that will occur, the inventoried recreation places important for tourism have been identified, and the potential effects from LUD allocations on these can be estimated. As before, the same assumptions about changes are made: that places within the Moderate and Intensive Development LUD groups are likely to experience changes in their settings over time which will alter or lower their natural values; that these changes for the most part will be gradual; and that they will not necessarily mean adverse effects, depending on the kinds of settings and features desired by users.

Table 3-35 displays tourism recreation place acres by LUD group. The Wilderness group is excluded since it stays constant, at 1.1 million acres, in all alternatives (and accounts for 42 percent of tourism recreation places). The total area within tourism recreation places Forest-wide is also constant, 2.2 million acres.

Table 3-35
Tourism recreation place acres (in 1,000's), by LUD group by alternative.

LUD Group[1]	Alternatives 1	2	3	4	5	6	7	8	9
W	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100
NS	1,143	740	852	740	774	774	365	583	601
MD	9	258	190	258	238	238	189	171	297
ID	3	157	112	157	142	142	600	400	256

Source: Query Q3093A
[1] W = Wilderness; NS = Natural Setting; MD = Moderate Development; ID = Intensive Development.

Public comment on the 1990 DEIS and 1991 SDEIS, and subsequent input from tourism industry representatives, has indicated the need to better differentiate tourism needs and opportunities from those of recreation in general. The Proposed Revised Forest Plan now includes tourism goals and objectives, and the Forest-wide standards and guidelines provide more specific direction for tourism considerations. One significant change is in defining the kinds of recreation and tourism facilities that may be provided by private sector development on National Forest land, and dividing them into "major" and "minor" categories. The standards and guidelines define these in detail, and specify which would be allowed, discouraged, or not allowed within each land use designation.

Major developments are long-term commitments of land that require some degree of site modification. They involve large buildings or complexes, and may provide several services in a concentrated area. Examples are lodges and ski areas. Minor developments involve only minor site modifications, and usually involve small, rustic facilities and a single use. Examples are cabins, cross-country ski trails, and small docks. (See Proposed Revised Forest Plan, Chapter 4.)

The development of tourism opportunities is a cooperative effort, with private sector investors and land management agencies working together to realize opportunities. The LUD prescriptions and Forest-wide standards and guidelines provide the framework for this effort.

General Summary

Over time the Tongass would continue to shift toward the developed end of the recreation opportunity spectrum under all alternatives except Alternative 1, bringing about increased opportunities associated with roads, and decreased opportunities associated with the more primitive forms of recreation. The degree of change varies by alternative. Alternative 1 maintains the current character of recreation opportunities, while Alternative 7 goes farthest in shifting much of the character into intensive, developed settings (almost 50 percent of total Forest acres). Alternatives 2-6 and 8 all maintain from 52-54 percent of total Forest acres in primitive settings, and another 14-18 percent in semi-primitive settings. Alternative 9 maintains 49 percent in primitive settings, and other 13 percent in semi-primitive; Alternative 7, 43 percent and 10 percent.

Forty percent of recreation place acres are within Wilderness and other legislated LUD's in all alternatives. Forest-wide, recreation places identified as important for particular uses (marine recreation, tourism, etc.) generally receive a higher degree of protection in the alternatives than do recreation places in general.

One result of shortages in Semi-primitive Motorized settings may be greater pressure on Wilderness, LUD II, and Monument areas. Some of these areas are already at or near capacity, while others are virtually unused. Those that are already heavily used generally have some attraction, such as a unique opportunity or easy access from a community. Heavier use in some of the areas may bring about increased restrictions on user numbers or the activities they engage in. This problem of distribution could be somewhat resolved by identifying substitute opportunities, or new ventures for outfitters, guides, and transportation services.

Implementation of any of the alternatives is not likely to significantly affect the tourism industry overall, particularly over the next decade. Growth of the tourism industry depends on many factors, many of them (such as world markets and politics) unrelated to management of the Tongass, and this growth has also occurred in concert with continued "development" of the Forest. Under all alternatives the Tongass will maintain the majority of its area in vast, undisturbed landscapes with numerous opportunities for various sectors of the tourism industry, although there may be certain locations where tourism operators are displaced due to timber harvest or mining.

Marketing of the unique recreation opportunities of the Tongass and Southeast Alaska is already capturing new market segments. Recent increases in activities such as non-consumptive uses of wildlife, kayaking, and cruise ship arrivals, suggest the trend will continue. One aspect of marketing is the recognition of changing preferences, as well as identifying new market segments. This will become more important if the character of the Forest changes significantly over time.

Research Natural Areas

Affected Environment

Research Natural Areas (RNA's) are part of a national network of field ecological areas designated for research and education and/or to maintain biological diversity on National Forest System lands. Research Natural Areas are used for non-manipulative research, observation, and study. They also may serve to carry out provisions of special acts, such as the Endangered Species Act and the monitoring provisions of the National Forest Management Act. The Tongass currently has six designated RNA's.

Existing Research Natural Areas, the potential (or, as they were called, the priority potential) new areas, and the processes used to identify these new areas, are all fully described in the 1991 SDEIS. Very little of that material is repeated here. Locations of the existing and proposed RNA's are indicated on the alternative maps (but not by name).

The 1991 SDEIS considered 30 potential new RNA's for allocation by alternative. Since that time the suitability of these areas has been reevaluated. The focus was on potential conflicts between Forest Service direction for managing Research Natural Areas, and the resources and existing and potential uses of each area. Considerations included additional information on mineral potential, possible land selections, desired fish improvement projects, likely future transportation needs, and developed as well as undeveloped recreation uses. The result of this reevaluation was that only 6 of the 30 potential RNA's remained suitable for designation. Likely conflicts with recreation uses was the primary reason. (The rationale for not retaining each of the 24 potential RNA's is included in the planning record.)

The six areas considered for RNA designation are Warm Pass, Marten River, Robinson Lake, Tonalite Creek, Kadin Island, and Rio Roberts. The Alaska Region and the Tongass National Forest have started or completed work on establishment proposals for all six, with the intent of seeking formal establishment as part of the Forest Plan Revision.

One existing Research Natural Area, Pack Creek (located within Admiralty Island National Monument) has been recommended for declassification, due to a long history of human presence related to viewing brown bear. Another area within Admiralty and with similar characteristics (old-growth spruce/hemlock forest and brown bear habitat), in Gambier Bay, is being proposed to replace Pack Creek. Gambier was one of the priority potential RNA's considered unsuitable due to recreation conflicts (use centered around a public cabin); it has been relocated within the Bay to avoid potential conflicts. All alternatives include Gambier as an existing RNA in place of Pack Creek.

Environmental Consequences

This section focuses on the effect that each alternative will have on the present or future establishment of a representative system of Research Natural Areas for the Tongass. The effects of Research Natural Area designations on other resources are covered under the sections for those resources. Designation of an area as an RNA will make it unavailable for certain resource uses, in particular those that involve land-altering activities such as timber harvest or road construction. Conversely, an RNA designation will preserve the natural qualities of an area, such as visual quality and existing wildlife habitat. For the purposes of analyzing effects to other resources, the Research Natural Area prescription is a part of the Natural Setting LUD group.

Table 3-36 displays the LUD group allocations for the six potential RNA's considered suitable for recommendation in the alternatives. All alternatives except Alternative 9 recommend Warm Pass, Marten River, Robinson Lake, and Tonalite Creek for Research Natural Area designation. In Alternative 9, these four areas are either within Wilderness, congressionally-designated LUD II, or other LUD II; the values of none are likely to be affected by these designations. The other two potential RNA's, Kadin Island and Rio Roberts, are recommended in Alternatives 1 through 6. In Alternatives 7-9, both Kadin Island and Rio Roberts would over time be subject to alterations from timber harvest and possibly road construction, and as such would lose the natural values associated with an RNA.

Table 3-36
Allocation of the six suitable potential RNA's by alternative

	Alternatives (1)				
	1	2	3-6	7-8	9
Warm Pass	R	R	R	R	N
Marten River	R	R	R	R	W
Robinson Lake	R	R	R	R	W
Tonalite Creek	R	R	R	R	N
Kadin Island	R	R	R	I	M
Rio Roberts	R	R	R	I	I

(1) Letter symbols represent the following: R= recommended for Research Natural Area designation; W= Wilderness LUD group; N= Natural Setting LUD group; M= Moderate Development LUD group; I= Intensive Development LUD group.

Table 3-37 includes the 24 (of the original 30) priority potential Research Natural Areas not recommended for establishment, and shows what management they would receive by alternative. Since the location of Gambier Bay as a replacement for Pack Creek changed, the original Gambier Bay is included in the table.

Over time, potential Research Natural Areas that are not designated may lose the natural qualities which qualified them for Research Natural Area consideration. This will occur primarily where land-altering activities take place. As potential but undesignated areas are changed in this way, the opportunities for research on the various ecological systems and their cell types will diminish. It can be seen from the previous table that the majority of the potential RNA's not considered suitable for recommendation at this time (15 of 24) are in the Wilderness or Natural Setting LUD groups in all alternatives.

Alternative 1 protects the values of all the rest. Alternatives 2-6 fully protect four others, and include at least portions of the rest in non-disturbance LUD's, with their core values likely to be maintained. Alternatives 7-9 are similar to 2-6 for most of the remaining non-suitable proposed RNA's, and are likely to significantly alter only one over time (Falls Creek Windthrow).

Seven areas proposed as priority potential RNA's were subsequently seen as better suited to Special Interest Area designation. These are: Pike Lakes, Blue Lake Lava (also called Blue River), Crater Ridge-Fred's Creek (also referred to as Mt. Edgecumbe), Bailey Bay Hot Springs, Mount Calder-Virginia Mountain, Thunder Mountain, and El Capitan.

Proposing areas as RNA's will have effects on other natural resource uses which occur in these specific areas. A total of 1,762 acres of tentatively suitable forested land is located within the RNA proposals, and would not be available under any of the alternatives. None of the six proposed RNA's are known to have high mineral potential or are likely to conflict with future transportation needs. Warm Pass, Tonalite Creek, and Kadin Island are inventoried recreation places, but designation is not anticipated to conflict with current recreation uses.

Table 3-37
Summary of how the priority potential RNA proposals are allocated in each alternative

	Alternatives [1]			
	1	2-6	7-8	9
Akwe Beach	N	N	N	N
Akwe-Ustay Lakes	N	N	N	N
Mountain Lake	W	W	W	W
Pike Lakes	W/N	W/N/M	W/M/I	W/M/I
Upper Situk	W/N	W/N	W/N/I	W/N/I
Dayebas Creek	N	N	N	N
Blue Lake Lava	W	W	W	W
Twin Lakes	W	W	W	W
Crater Ridge-Freds Creek	N	N	N/M	M
Myriad Islands	W	W	W	W
Plotnikof-Pt Bank	W	W	W	W
Gambier Bay	W	W	W	W
Tiedeman Island	W	W	W	W
Pleasant Island	W	W	W	W
Upper Tenakee Hot Springs	N	N/M/I	N/M/I	N/M
Swan Cove	W	W	W	W
Bailey Bay Hot Springs	N	N	N	N
Falls Creek Windthrow	N	N	I	I
South Etolin Island	W	W	W	W
Mt. Calder-Virginia Mt.	N	N/I	N/I	N/I
Sarkar Lakes	N	N/I	I	N/I
Thunder Mountain	N	N	I	I
Klakas Lake	WN	W/N/I	W/I	W/N
El Capitan	N	N	N	N

[1] Letter symbols represent the following: W= Wilderness LUD group; N= Natural Setting LUD group; M= Moderate Development LUD group; I= Intensive Development LUD group.

Roadless Areas

Affected Environment

The roadless inventory describes the extent of the roadless resource, and provides data for use by managers, legislators and others to formulate land management proposals. Roadless areas may retain their roadless character by being managed for emphases which require relatively large, undeveloped or natural areas, such as usually required for old-growth habitat, scenic backdrops or for primitive recreation. Roadless areas identified in the inventory have the potential to be considered for Wilderness recommendation or to be managed for a wide range of other resource management activities. Identifying this potential does not imply that areas should or should not be recommended for designation as Wilderness, but is intended to portray the remaining undeveloped portions of the National Forest for which Wilderness may be a future option.

There are currently 112 individual roadless areas with a total of 9.45 million acres which meet the minimum criteria for potential inclusion in the National Wilderness Preservation System. The number of areas and acreage has changed since the 1991 SDEIS due to continuing timber harvest and road construction, better inventory information, and land ownership changes. The Roadless Area Map in the map packet shows the locations and boundaries of these 112 areas.

The minimum criteria for considering the Wilderness potential of roadless areas was established by the Wilderness Act of 1964 and in subsequent regulation and policy. To qualify, an area usually must contain at least 5,000 acres of undeveloped land which does not contain improved roads maintained for travel by passenger-type vehicles. Areas less than 5,000 acres may qualify if they are self-contained ecosystems such as islands, are contiguous to existing Wilderness, or are ecologically isolated by topography and manageable in a natural condition.

The Tongass has very large undeveloped land areas that could potentially be managed as Wilderness or in an unroaded condition. Several portions of the Forest constitute contiguous roadless areas that exceed one million acres, and thus represent large, unfragmented wildlife habitats and outstanding opportunities for solitude. Many of the Tongass roadless areas represent wildlife habitats, ecosystems, and visual character that exist nowhere else in the National Forest System, such as coastal islands facing the open Pacific, extensive beaches on inland saltwater, old-growth temperate rain forests, ice fields, and glaciers.

Appendix C of the 1991 SDEIS describes the attributes and resource potentials of the 105 roadless areas identified at that time, evaluates each area's capability and availability for management as Wilderness or allocation to other roadless management prescriptions, and displays the effects of the alternatives on each. Appendix C has not been updated for the Revised Supplement, but will be for the FEIS.

Public recreation use of Southeast Alaska's roadless undeveloped lands is light but increasing. Modern technology has made available improved clothing, equipment, and other gear, responding to new trends or leading to increased use. Continued tourism marketing may also lead to increased public use of wilderness and other roadless recreation opportunities. Demands for natural areas to provide clean water and air, reduce effects of global warming, and offset deforestation are increasing as these global issues increase.

Environmental Consequences

No additional Wilderness is proposed in any alternative, since additional Wilderness for the Tongass was recently debated as part of Congressional action leading to passage of the Tongass Timber Reform Act of 1990. However, the allocations of roadless areas to other (non wilderness) land use designations vary significantly by alternative. Table 3-38 displays how the roadless lands are allocated to the three LUD groups (other than Wilderness) by alternative. The groups indicate the potential for development or for retention of the natural setting, and by extension the likelihood of roadless areas retaining the opportunity for future Wilderness designation. LUD's only specify the types of activities that may occur; only through project implementation will the location, timing or intensity of changes in roadless character or values be known. In Appendix C (of the 1991 SDEIS), activities associated with currently approved timber sale projects are identified more specifically in describing the potential environmental consequences for individual roadless areas.

The LUD's in the Moderate and Intensive LUD groups allow timber management with associated road and log transfer facility construction in areas with suitable forest lands. The LUD's in the Natural Setting LUD group emphasize the retention of the natural setting and undeveloped character of an area, and generally do not allow commercial timber harvest. Certain roads linking transportation systems, particularly major State corridors, may be built. Not all of an area subject to the type of development allowed by a particular LUD would actually be developed, nor would development in such areas normally occur all at one time. This Forest-wide-level analysis serves primarily as a general indication of the likely effects of alternatives on the future roadless character and potential for additional Wilderness of the Tongass.

Table 3-38
Allocation of total roadless area (in 1,000 acres) to LUD group by alternative [1]

LUD	Alternatives								
Group[2]	1	2	3	4	5	6	7	8	9
NS	9,677	5,854	6,603	5,834	6,138	6,138	3,247	4,462	4,717
MD	13	1,223	872	1,223	1,105	1,105	1,457	1,356	1,914
ID	108	2,528	2,129	2,528	2,361	2,361	4,923	3,809	2,783

[1] This is in addition to the 5.7 million acres of Wilderness within the Tongass.
[2] NS = Natural Setting; MD = Moderate Development; ID = Intensive Development.

Scenery

Affected Environment

The Tongass National Forest offers a variety of scenery to its visitors, from spectacular mountain ranges and the glaciers of the mainland to low-lying marine landscapes composed of intricate waterways, bays and island groups.

The Forest is viewed from a variety of vantage points: the communities of Southeast Alaska; the Alaska Marine Highway ferry route, cruiseship routes, existing road systems, and popular small boat routes; and anchorages, developed recreation sites and facilities, and remote hiking trails. Tourist-related "flightseeing" via small aircraft is on the increase and provides aerial views of the forest landscape. (See also the "tourism" discussion under Recreation and Tourism.)

The visual character of the Tongass, its landscape character types, existing visual condition, scenic potential and other aspects, is described and discussed in the 1991 SDEIS. That information has not changed and will not be repeated here. The SDEIS also explains how the scenic resource is described, inventoried and managed for National Forest lands. Inventoried visual quality objectives (VQO's) are assigned for each area or landscape based on the criteria described in the SDEIS.

The four VQO's used for the Tongass are retention, partial retention, modification, and maximum modification; each, in that order, allows an increasing amount of alteration of the natural landscape character. (A fifth category, preservation, typically assigned to wilderness, is not used for Tongass wilderness due to the potential alterations allowed under the Alaska National Interest Lands Conservation Act. See Wilderness.) In terms of forest management, the visual quality objectives can be defined as follows:

> Retention - Activities are designed so as not to be visually evident to the casual forest visitor.
>
> Partial Retention - Activities may be evident, but will remain visually subordinate to the characteristic landscape.
>
> Modification - Activities may dominate the characteristic landscape, but will borrow from existing form, line, color and texture. Alterations appear to be natural when viewed as foreground or middleground.
>
> Maximum Modification - Activities may dominate the characteristic landscape. Alterations appear to be natural when viewed as background.

Throughout this section, the categories and objectives displayed in the tables do not include areas within Wilderness. There has been no formal scenery inventory conducted in Wilderness, although from the inventory standpoint, every acre of Wilderness would have a preservation VQO, and almost every acre would have a Type I existing visual condition (discussed below). From the management standpoint, all Wilderness has been assigned a VQO of retention to cover the few areas where development may be allowed by the Alaska National Interest Lands Conservation Act. In reality the vast majority of Wilderness acreage will be managed through the specific

Wilderness plans with a preservation VQO. All alternatives include all the same Wildernesses, approximately 5.7 million acres. Therefore, since the intent of this section is to display what is happening on the potentially developed areas of the forest, and to highlight the differences in the effects of the alternatives, Wilderness acres are not included.

The current Forest-wide breakdown of inventoried VQO's is shown in Table 3-39. In this and succeeding tables, a breakdown between "seen" and "seldom-seen" areas is presented. Seen areas are those areas that can be viewed in the foreground, middleground, or background from the inventoried sensitivity level 1 or 2 use areas and travel routes (these are discussed at the end of this section). Seldom-seen areas are all the rest of the Forest outside Wilderness.

Table 3-39
Current ("Inventory") Visual Quality Objectives for the Tongass, in acres excluding Wilderness [1]

	Visual Quality Objective			
	Retention	Partial Retention	Modification	Maximum Modification
Chatham Area				
Seen Areas	925,066	1,541,831	455,482	2,799
Seldom-seen	560	841,583	1,108,164	330,960
Stikine Area				
Seen Areas	161,341	564,330	305,659	11,021
Seldom-seen	740	896,621	310,391	614,208
Ketchikan Area				
Seen Areas	220,887	546,959	227,595	4,815
Seldom-seen	8,950	219,906	427,044	1,042,065
Tongass Total				
Seen Areas	1,307,294	2,653,120	988,736	18,635
Seldom-seen	10,250	1,958,110	1,845,599	1,987,233

[1] Wilderness totals 5,723,253 acres forest-wide that have not been inventoried.

The Tongass is characterized by everything from vast tracts unmodified by human activity to extensive areas of heavily modified landscapes. An inventory of the existing visual condition (EVC) is used to document the degree of alteration that presently exists within an area. These ratings apply to the broad landscape affected, not just the acres altered. This inventory is also described in the SDEIS. Table 3-41 below displays the current Forest-wide breakdown of existing visual condition ratings. Comparison of this table with the comparable table in the SDEIS reflects changes in the acres by EVC class due to management activities that have taken place since the SDEIS was released in 1991.

EVC types, and their relation to the VQO's, are described in Table 3-40. Since timber harvesting and some other management activities can affect the visual character of an area beyond the acres actually altered, EVC can provide a baseline against which to measure potential changes. Mapping methods and criteria are somewhat different for EVC and VQO's, but the correlation is close enough for use in comparing Forest Plan alternatives and their adopted VQO's to the Forest's existing visual condition. EVC's are also used in this way in the effects analysis of specific viewsheds.

Table 3-40
Existing Visual Condition (EVC) definitions and related visual quality objectives (VQO's)

EVC	Description	VQO
Type I	Ecological changes only	Preservation
Type II	Activity not evident	Retention
Type III	Activity may be noticed but subordinate to natural character	Partial Retention
Type IV	Activity easily noticed, dominant but blends well with landscape	Modification
Type V	Activities strong in contrast, easily noticed	Maximum Modification
Type VI	Activities in glaring contrast to natural landscape appearance	Exceeds minimum guides

Table 3-41
The Existing Visual Condition of the Tongass in acres excluding Wilderness [1]

EVC Rating	Type I	Type II	Type III	Type IV	Type V	Type VI
Chatham Area						
Seen	2,607,005	19,286	33,655	61,611	187,547	16,075
Seldom-seen	2,199,694	720	5,805	19,680	61,613	860
Stikine Area						
Seen	745,366	6,919	41,758	72,341	174,814	3,073
Seldom-seen	1,567,239	2,240	7,995	68,712	171,154	8,762
Ketchikan Area						
Seen	701,546	6,323	57,355	120,191	109,209	5,631
Seldom-seen	1,347,743	10,210	6,368	109,085	221,332	4,628
Tongass Total						
Seen	4,053,917	32,528	132,768	254,143	471,570	24,779
Seldom-seen	5,114,676	13,170	20,168	197,477	454,099	14,250

[1] Wilderness totals 5,723,253 acres forest-wide that have not been inventoried.

Demand for scenic quality can best be represented by the increase in tourist-related travel to the Tongass, as well as a heightened awareness and sensitivity of Alaskan residents to scenic resource values (see Recreation and Tourism). Southeast Alaska's Inside Passage is advertised and promoted by the Division of Tourism, cruiseship operators, and the Southeast Alaska Tourism Council. Their marketing strategy focuses on the scenery of the Tongass National Forest as a major attraction. The visitor to Southeast Alaska would, therefore, arrive with expectations and an image of the environment and scenery awaiting them. If current trends continue, demand for viewing scenic landscapes will increase. Lands adjacent to the Alaska Marine Highway, cruiseship routes, flightseeing routes, high use recreation areas, and other marine and land-based travel routes will be seen by more people, more frequently, and for greater durations.

Environmental Consequences

Introduction

The current Forest Plan does not have definitive visual quality objectives for all specific viewsheds on the Forest. For the most part, specific visual objectives have been developed by each Administrative Area on a project-by-project basis using the inventoried objectives as a starting point. The 1991 SDEIS discusses this process in more detail.

Revised Forest Plan alternatives, on the other hand, include prescribed VQO's for each proposed land use designation, and the final Revised Plan will adopt the specific VQO's of each of its LUD's. These adopted VQO's will indicate the desired or acceptable level of human-induced alterations to the natural landscape character. Each alternative described in this Revised Supplement, if implemented, would maintain, alter or enhance the visual character of the landscapes of the Tongass to varying degrees, according to the mix of LUD's.

The potential effects to the scenic resource are described in two ways:

1. A Forest-wide display of acres of each visual quality objective adopted as a result of each alternative, discussed by alternative. This includes all acres of the Forest outside of designated Wilderness (Wilderness is common to all alternatives).

2. A display of the effects of each alternative on a selected group of key viewsheds spread throughout the Tongass.

Direct, Indirect, and Cumulative Forest-wide Effects

Table 3-42 displays Forest-wide the visual quality objectives adopted for each alternative. Both seen and seldom-seen areas are included. The acres displayed in these tables include all the inventoried acres in all LUD's except the Wilderness LUD's, which do not vary by alternative. (Retention is the adopted VQO for all areas within Wilderness and Wilderness National Monument.) The alternatives vary in how the "timber harvest" LUD's (Scenic Viewshed, Modified Landscape, Timber Production) are distributed, and in the silvicultural practices (harvest methods) specified within these LUD's. Non-clearcut methods are sometimes applied to meet retention or partial retention objectives, and in some alternatives to meet other resource objectives. In the latter case, visual quality objectives higher than those adopted are likely to be met.

A third way in which alternatives vary is in the extent of allocation of old-growth forest reserves (the Old-growth Habitat LUD). In some alternatives old-growth forest reserves are assigned to portions of several visually sensitive areas, and thus the natural character within the reserves portions will be maintained. Discussions by alternative follow Table 3-43.

It should be noted that the visual effects of timber harvest activities are not limited to the specific location of the activity. As seen from a travel route or use area, such alterations can affect the visual appearance of the entire viewed landscape (or "viewshed"). For this reason, the acreages of visual effect tend to be greater than the acres of suitable forest land within a given area. Conversely, these effects may be smaller because they will not happen all at once. While some viewsheds are likely to have significant alterations over the next decade, others may not be entered, or entered only lightly, for several decades. In this sense, the Forest-wide VQO's are best thought of as an indicator of long-term, cumulative effects.

Table 3-42
Visual Quality Objectives by alternative, Forest-wide

Alternative	Retention	Visual Quality Objective Partial Retention	Modification	Maximum Modification
Alternative 1				
Seen Areas	2,337,325	2,893,975	1,180	741
Seldom-seen	3,583,642	1,983,636	0	220,171
Wilderness	5,723,253			
Alternative 2				
Seen Areas	1,822,706	1,653,882	452,668	1,307,249
Seldom-seen	1,728,367	1,425,858	0	2,637,386
Wilderness	5,723,253			
Alternative 3				
Seen Areas	2,331,436	1,483,042	366,293	1,055,735
Seldom-seen	2,091,290	1,425,858	0	2,274,463
Wilderness	5,723,253			
Alternative 4				
Seen Areas	1,822,706	1,653,882	452,668	1,307,249
Seldom-seen	1,728,667	1,425,858	0	2,637,386
Wilderness	5,723,253			
Alternative 5				
Seen Areas	1,978,690	1,615,361	421,656	1,220,796
Seldom-seen	1,902,330	1,425,858	0	2,463,424
Wilderness	5,723,253			
Alternative 6				
Seen Areas	2,021,316	1,598,775	416,157	1,200,732
Seldom-seen	1,934,607	1,411,096	0	2,446,188
Wilderness	5,723,253			
Alternative 7				
Seen Areas	1,160,149	597,493	1,010,389	2,465,605
Seldom-seen	834,616	690,578	0	4,259,651
Wilderness	5,723,253			
Alternative 8				
Seen Areas	1,977,239	580,517	767,556	1,908,325
Seldom-seen	1,410,700	690,578	0	3,683,566
Wilderness	5,723,253			
Alternative 9				
Seen Areas	2,631,432	1,090,184	354,184	1,157,866
Seldom-seen	2,529,073	0	0	3,255,771
Wilderness	5,723,253			

Source: Q47D

Another way to assess relative effects on scenic quality is to compare, by alternative, the acreages allocated to the Scenic Viewshed, Modified Landscape, Timber Production, other development LUD's (Nonwilderness National Monument and Experimental Forest), Wild, Scenic or Recreational River (Scenic or Recreational Rivers could have some timber harvesting within their corridors), and the Natural Setting LUD group (which includes Remote and Semi-remote Recreation, Old-growth Forest, and LUD II). These comparisons are shown in Table 3-43, and discussed by alternative below.

Table 3-43
"Development" LUD and Natural Setting LUD Group acres (in 1,000's), by alternative [1]

	Alternatives								
LUD	1	2	3	4	5	6	7	8	9
Development LUD's:									
SV	1	815	577	815	761	759	0	0	
ML	0	856	680	856	761	755	1,484	1,368	
TM	222	3,482	2,981	3,482	3,295	3,258	6,336	5,058	
OD	169	181	181	181	181	181	181	181	184
WSR [2]	332	91	91	91	91	91	0	0	
LUD III									2,334
LUD IV									3,818
Natural Setting LUD Group	10,688	5,875	6,892	5,876	6,212	6,448	3,357	4,751	4,883

[1] SV = Scenic Viewshed, ML = Modified Landscape, TM = Timber Production, OD = other development LUD's (see text), WSR = Wild/Scenic/Recreational River. For Alternative 9, LUD III is roughly equivalent to the total of SV and ML in the other alternatives, and LUD IV equivalent to TM. In addition, each alternative has 5,723 thousand acres of Wilderness.
[2] "Development" in terms of timber harvesting or road construction would only occur in Scenic or Recreational Rivers. Rivers proposed within Wilderness are not included.

The following paragraphs briefly summarize and compare the effects of each alternative based on the preceding tables:

Alternative 1. This alternative allocates all areas seen from all use areas and travel routes, recreation places, and areas identified as important by the public, that are outside existing Wilderness and LUD II areas, to Remote or Semi-remote Recreation. Therefore all of the inventoried seen areas and recreation places will have an adopted VQO of retention or partial retention. This means in effect that any timber harvest or road construction will take place only outside the Forest's seen areas. The designated VQO's would primarily be applied to specific developments such as small-scale recreation facilities and resorts.

Alternative 2. This alternative allocates key viewsheds around communities, heavily used saltwater boating areas, anchorages and some sensitive viewsheds associated with popular Forest Service cabins, campgrounds, day-use areas and canoe routes primarily to either Scenic Viewshed or Modified Landscape. Along the saltwater boating routes, cruise ship routes and ferry routes, lands are allocated to a mix of LUD's, with the adopted VQO's ranging from retention to maximum modification. The adopted VQO's in viewsheds associated with recreation sites are generally retention or partial retention. Some additional protection is given by the designation of 24 river segments as Wild, Scenic or Recreational Rivers. As indicated in Table 3-42, 3,480,000 acres, 66 percent of all seen areas on the forest outside Wilderness, will have a visual quality objective of retention or partial retention (with 1,823,000 acres of retention).

Alternative 3. This alternative is similar to Alternative 2, but adopts a higher visual quality objective (retention) in all or part of some viewsheds due to its Forest-wide old-growth reserve system (Old-growth Forest LUD). For example, several saltwater boat routes allocated primarily to either Scenic Viewshed, Modified Landscape, or Timber Production in Alternative 2 are interspersed with Old-growth Forest allocations in Alternative 3. This alternative also includes an expanded beach fringe (only allowing uneven-aged harvest methods) that may enhance scenic protection in some foreground viewsheds. Alternative 3 has 3,814,000 acres with a VQO of retention or partial retention, 73 percent of all seen areas outside Wilderness. Of this total, 2,331,000 acres will have a retention VQO, about a half-million more than Alternative 2.

Alternative 4. Alternative 4 has the same LUD allocations as Alternative 2, and hence adopts the same VQO's for the same areas. However, Alternative 4 uses only extended rotation two-aged and uneven-aged timber harvesting, and is likely to result in greater scenic protection in some areas than called for by the adopted VQO. As in Alternative 3, the extended beach fringe may also afford greater scenic protection to some foreground areas. As indicated in Table 3-42, 3,480,000 acres, 66 percent of all seen areas on the forest outside Wilderness, will have a visual quality objective of retention or partial retention (with 1,823,000 acres of retention).

Alternative 5. Alternative 5 is also based on Alternative 2, adding a more limited reserve system than did Alternative 3. These Old-growth Forest LUD's are concentrated on Chichagof Island, Kupreanof Island, the north half of Prince of Wales Island, and Dall Island; the rest of the viewsheds on the Forest are allocated as they are in Alternative 2. This alternative may also afford greater scenic protection for some viewsheds due to the use of longer harvest rotations, uneven-aged or two-aged management, and an expanded beach fringe. Alternative 5 has 3,594,000 acres with a VQO of retention or partial retention, 69 percent of all seen areas on the forest outside Wilderness. Of this total, 1,979,000 acres will have a retention VQO. Forest-wide, Alternative 5 adopts the retention VQO for about 150,000 more acres than Alternative 2, but about 350,000 acres less than Alternative 3.

Alternative 6. Alternative 6 is identical to Alternative 5 with the exception of the timber harvest methods employed. Therefore, the additional scenic protection afforded by the longer harvest rotations, and uneven-aged or two-aged management, in Alternative 5 would not be realized in Alternative 6. Otherwise the effects would be as discussed for Alternative 5. Alternative 6 has 3,594,000 acres with a VQO of retention or partial retention, 69 percent of all seen areas on the forest outside Wilderness, and of this total, 1,979,000 acres will have a retention VQO. Like Alternative 5, Alternative 6 adopts the retention VQO for about 150,000 more acres than Alternative 2, but 350,000 acres less than Alternative 3.

Alternative 7. In Alternative 7 over half of the Forest's inventoried viewsheds (about 3,480,000 acres) are allocated to Timber Production with adopted VQO's of modification and maximum modification. The only viewsheds allocated to a scenic emphasis are those that are part of the legislated LUD II areas, and some areas adjacent or important to communities, primarily in the Chatham Administrative Area. Viewsheds with a VQO of retention or partial retention in Alternative 7 total 1,760,000 acres, 34 percent of all seen areas on the forest outside Wilderness. Of this total about 1,160,000 acres will have a retention VQO.

Alternative 8. Alternative 8 adds a Forest-wide old-growth reserve system to Alternative 7, and the expanded beach fringe. This results in several viewsheds or portions of viewsheds, particularly those saltwater-oriented ones, changing to an adopted VQO of retention, while the remaining viewsheds or portions will for the most part have an adopted VQO of modification or maximum modification as in Alternative 7. Viewsheds with a VQO of retention or partial retention total 2,558,000 acres, 49 percent of all seen areas on the forest outside Wilderness. Of this total, 1,977,000 acres will have a retention VQO, about 817,000 acres more than Alternative 7.

Alternative 9. This alternative reflects the current Forest Plan. In addition to the retention VQO adopted for the legislated LUD II's, it establishes a retention and partial retention adopted VQO for LUD III's and a retention and partial retention are adopted for much of the same viewsheds as in Alternative 2. About 3,722,000 acres, 59 percent of all seen areas on the forest outside Wilderness, have an adopted VQO of retention or partial retention. Of this total, 2,631,000 acres will have a retention VQO.

Effects on Selected Viewsheds

The 1991 SDEIS primarily used a Forest-wide approach to analyzing the potential effects to scenic quality. For the Revised Supplement, an analysis by selected viewsheds has been added. The most critical specific viewsheds Forest-wide, based on intensity of public use and travel, are evaluated in terms of potential effects to the scenery. This helps focus the effects analysis on the more familiar areas. The discussions following the table also identifiy where the effects of past management on scenery may necessitate minimizing activities for a period of time if the adopted VQO's cannot be met.

Table 3-44 displays the acres of VQO's that would be adopted for each alternative in each of 22 selected viewsheds (columns headed 1-9). The left-hand column displays the existing visual condition (EVC) in each viewshed. Note that VQO and EVC terminology is combined in the far left column. The correlation between the two is displayed in Table 3-40 in the affected environment section. Each viewshed is discussed following the table. As previously mentioned, while some viewsheds are likely to have significant alterations over the next decade, others may not be altered, or entered only lightly, for several decades.

Table 3-44
Adopted VQO's for selected viewsheds by alternative [1] [2]

Travel Route/ Viewshed	EVC	Alternative 1	2	3	4	5	6	7	8	9
Behm Canal										
Type I EVC	28,797									
Retention(II)	160	25,979	2,645	9,674	2,645	2,645	2,645	120	9,330	3,985
Par. Ret(III)	3,729	13,776	9,252	7,710	9,252	9,252	9,252	420	420	6,009
Modific.(IV)	1,582		16,784	11,717	16,784	16,784	16,784	9,393	6,290	5,948
Max. Mod.(V)	5,487		11,075	10,654	11,075	11,075	11,075	29,822	23,715	23,813
Type VI EVC										
Chatham Strait										
Type I EVC	90,093									
Retention(II)	618	31,407	27,251	56,604	27,251	44,391	48,865	34,873	64,626	39,102
Par. Ret(III)	360	84,837	24,670	19,874	24,670	20,971	20,491			15,642
Modific.(IV)	700		8,173	3,733	8,173	4,993	4,754	5,768	4,148	1,819
Max.Mod.(V)	24,472		56,149	36,032	56,149	45,889	42,134	75,602	47,469	59,680
Type VI EVC	20									
Cholmondeley Sound										
Type I EVC	36,796									
Retention(II)		17,124		4,984					4,944	5,528
Part. Ret(III)		19,430	3,966	3,966	3,966	3,966	3,966			11,617
Modific.(IV)	360		11,567	11,567	11,567	11,567	11,567	11,018	3,297	6,771
Max. Mod.(V)	922		22,525	17,541	22,525	22,525	22,525	25,438	28,215	14,142
Type VI EVC										
Clarence Strait										
Type I EVC	46,498									
Retention(II)	782	21,047	4,800	23,126	4,800	14,032	14,032		24,170	5,080
Part.Ret.(III)	5,332	53,979	23,247	16,090	23,247	23,126	23,126			26,584
Modific.(IV)	13,603		27,419	18,008	27,419	18,408	18,408	12,177	8,396	5,479
Max.Mod.(V)	8,490		19,519	17,761	19,519	19,419	19,419	62,909	42,520	29,557
Type VI EVC	381									
Duncan Canal										
Type I EVC	16,547									
Retention(II)		5,614	1,219	6,275	1,219	6,275	6,275		7,794	3,895
Part.Ret(III)	300	22,106	10,952	7,375	10,952	7,375	7,375			7,075
Modific.(IV)	5,496		8,875	8,135	8,875	8,135	8,135	5,116	1,999	2,139
Max.Mod.(V)	5,397		6,674	5,934	6,674	5,934	5,934	22,604	17,928	14,611
Type VI EVC										
Eastern Passage										
Type I EVC	49,326									
Retention(II)	380	20,563	5,461	17,762	5,461	5,461	5,461		18,602	4,861
Part.Ret.(III)	7,802	51,169	48,869	37,347	48,869	48,869	48,869			30,965
Modific.(IV)	1,880		8,321	8,161	8,321	8,321	8,321	10,101	5,421	5,240
Max.Mod.(V)	12,903		9,081	8,461	9,081	9,081	9,081	62,191	48,269	23,863
Type VI EVC										

Travel Route/ Viewshed	EVC	Alternative 1	2	3	4	5	6	7	8	9
Ernest Sound										
Type I EVC	28,345									
Retention(II)		15,181	1,041	14,258	1,041	5,792	5,792		13,198	20
Part.Ret.(III)	20	16,202	7,302	6,583	7,302	6,883	6,883			
Modific.(IV)	3,157		10,872	7,298	10,872	8,217	8,217	4,842	4,222	3,802
Max.Mod.(V)			12,287	3,363	12,287	10,610	10,610	26,540	13,962	22,999
Type VI EVC										
Frederick Sound										
Type I EVC	63,082									
Retention(II)	2,060	17,874	1,221	15,851	1,221	4,714	4,714		14,671	1,861
Part.Ret.(III)	120	63,007	34,571	27,438	34,571	34,531	34,531			20,378
Modific.(IV)	10,117		7,362	7,242	7,362	7,322	7,322	2,822	2,782	1,421
Max.Mod.(V)	5,562		37,767	30,390	37,767	34,354	34,354	77,419	62,788	57,261
Type VI EVC										
Hyder/Salmon River Highway										
Type I EVC	24,025									
Retention(II)		12,362	11,302	11,302	11,302	11,302	11,302			11,282
Part.Ret.(III)		11,662	12,722	12,722	12,722	12,722	12,722	24,025	24,025	12,742
Modific.(IV)										
Max.Mod.(V)										
Type VI EVC										
Icy Strait										
Type I EVC	36,237									
Retention(II)		5,607	220	14,623	220	260	1,021		14,483	80
Part.Ret.(III)	3,698	45,870	9,983	8,341	9,983	9,983	9,983	80		360
Modific.(IV)	280		560	560	560	560	560	1,740	1,380	1,380
Max.Mod.(V)	11,322		40,754	27,993	40,754	40,714	39,953	49,657	35,614	49,717
Type VI EVC										
Lynn Canal										
Type I EVC	138,617									
Retention(II)	401	28,316	20,470	42,184	20,470	20,470	20,470	12,140	48,102	63,395
Part.Ret.(III)	2,422	112,963	92,072	74,376	92,072	92,072	92,072	19,167	14,512	43,218
Modific.(IV)			21,817	21,797	21,817	21,817	21,817	84,133	53,427	
Max.Mod.(V)			6,961	2,963	6,961	6,961	6,961	23,302	22,702	18,681
Type VI EVC										
Mendenhall Glacier										
Type I EVC	252,987									
Retention(II)		163,540	163,780	163,780	163,780	163,780	163,780	163,520	163,540	140,604
Part.Ret.(III)	959	90,406	90,166	90,166	90,166	90,166	90,166	68,343	68,343	113,341
Modific.(IV)								11,505	11,505	
Max.Mod.(V)								10,578	10,558	
Type VI EVC										
Peril Strait										
Type I EVC	120,582									
Retention(II)	720	1,744	24,014	69,371	24,014	24,074	29,206	20	59,772	27,447
Part.Ret.(III)	2,194	165,515	44,684	40,690	44,684	44,684	39,552	24,953	24,953	57,020
Modific.(IV)	13,793		11,276	4,374	11,276	11,256	11,256	15,566	6,439	220
Max.Mod.(V)	26,151		87,365	52,904	87,365	87,325	87,325	126,720	76,095	71,890
Type VI EVC	5,239									

Travel Route/ Viewshed	EVC	Alternative 1	2	3	4	5	6	7	8	9
Salmon Bay Lake										
Type I EVC	2,056									
Retention(II)	80	20	119	2,002	119	2,002	2,002		1,982	119
Part.Ret.(III)	1,761	4,174	3,162	1,499	3,162	1,499	1,499	20		3,778
Modific.(IV)			536	396	536	396	396	100	20	
Max.Mod.(V)	296		377	296	377	296	296	4,074	2,192	296
Type VI EVC										
Stephens Pass										
Type I EVC	127,296									
Retention(II)	1,061	9,114	12,149	35,401	12,149	12,149	13,083	2,508	36,714	10,625
Part.Ret.(III)	1,060	118,789	90,986	69,307	90,986	90,986	90,847	17,464	14,671	55,898
Modific.(IV)	520		2,607	1,573	2,607	2,607	2,091	41,618	27,228	1,440
Max.Mod.(V)	3,932		22,180	21,641	22,180	22,180	21,902	65,534	48,510	33,682
Type VI EVC										
Stikine Strait										
Type I EVC	32,848									
Retention(II)		1,302	461	8,853	461	461	461		8,392	461
Part.Ret.(III)	921	53,169	43,475	35,423	43,475	43,475	43,475			51,270
Modific.(IV)	4,619		1,883	1,883	1,883	1,883	1,883	461	461	
Max.Mod.(V)	16,083		8,652	8,312	8,652	8,652	8,652	54,010	45,618	2,740
Type VI EVC										
Sumner Strait										
Type I EVC	21,829									
Retention(II)	100	10,886	9,120	14,224	9,120	11,948	13,268	3,915	9,039	7,317
Part.Ret.(III)	4,553	54,905	17,508	17,408	17,508	17,408	17,408			23,853
Modific.(IV)	9,842		6,844	6,844	6,844	6,844	6,844	9,370	9,370	5,908
Max.Mod(V)	29,447		32,298	27,294	32,298	29,571	28,251	52,485	47,361	28,692
Type VI EVC										
Sweetwater Lake/Honker Divide										
Type I EVC	11,699									
Retention(II)	1,380	7,402	7,181	10,361	7,181	*12,622	12,622		5,081	7,421
Part.Ret.(III)	4,881	14,859	7,060	5,620	7,060	4,699	4,699			8,821
Modific.(IV)	3,240		7,720	5,980	7,720	4,640	4,640	9,040	7,300	1,740
Max.Mod.(V)	1,080		420	420	420	420	420	13,221	9,880	4,400
Type VI EVC	100									
Tenakee Inlet To Tenakee Springs										
Type I EVC	23,202									
Retention(II)		1,980	460	9,439	460	7,701	9,620		9,419	1,879
Part.Ret.(III)	780	41,288	1,400	20	1,400	20	20			4,700
Modific.(IV)	4,074		2,358	2,358	2,358	2,358	2,338	460	20	20
Max.Mod.(V)	14,772		39,049	31,450	39,049	33,189	31,289	42,788	33,808	33,548
Type VI EVC	440									
West Coast Waterway - P.O.W.										
Type I EVC	44,452									
Retention(II)	861	14,907	13,459	23,221	13,459	*19,390	21,637	8,855	21,722	3,494
Part.Ret.(III)	7,527	67,726	11,215	10,835	11,215	11,054	10,733			
Modific.(IV)	10,101		24,315	21,526	24,315	23,732	23,091	28,115	25,449	7,039
Max.Mod.(V)	19,671		33,624	27,031	33,624	28,436	27,152	45,664	35,461	16,230
Type VI EVC	100									

Travel Route/ Viewshed	EVC	Alternative 1	2	3	4	5	6	7	8	9
Wrangell Narrows										
Type I EVC	32,020									
Retention(II)	1,301	4,003	11,044	17,245	11,044	17,245	17,245		11,144	8,883
Part.Ret.(III)	920	38,785	25,022	19,542	25,022	19,542	19,542			28,686
Modific.(IV)	3,141		2,221	2,161	2,221	2,161	2,161	8,263	6,121	
Max.Mod.(V)	7,045		4,700	4,040	4,700	4,040	4,040	34,725	25,722	4,280
Type VI EVC										
Zimovia Strait										
Type I EVC	27,641									
Retention(II)	80	841	5,179	14,064	5,179	5,179	5,179		10,267	2,980
Part.Ret.(III)	2,800	39,24	25,662	21,121	25,662	25,662	25,662			17,678
Modific.(IV)	1,941		5,106	1,021	5,106	5,106	5,106	5,761	4,219	2,781
Max.Mod.(V)	7,644		4,080	3,820	4,080	4,080	4,080	34,345	25,620	16,667
Type VI EVC										

Source: Queries 47F and Viscomy
(1) EVC and VQO terms are defined in the Scenery affected environment section. With two exceptions the Wilderness portions of viewsheds are not included. The Clarence Strait viewshed includes a portion of South Etolin Island Wilderness, and the Duncan Canal viewshed includes a portion of Duncan Salt Chuck Wilderness.
(2) The acres in the table are only those seen from a Visual Priority Travel Route and Use Area

Alternative effects are discussed below for each viewshed. Two points to keep in mind are:

1. Where an area is allocated to Semi-Remote Recreation, the resulting VQO is essentially retention since this LUD precludes commercial timber harvest. The formally adopted VQO of partial retention is primarily intended to provide a standard for recreation and tourism types of development, from small cabins to resorts, and the facilities associated with these developments. In most cases the effects would be confined to small, widely-scattered sites rather than spread over a broad landscape.

2. In Alternatives 3, 4, 5, 6 and 8, the use of uneven-aged management in an expanded beach fringe, and in Alternatives 4 and 5 the use of uneven-aged management elsewhere and expanded timber harvest rotations, may afford greater scenic protection than indicated by the adopted VQO.

West Behm Canal. Alternative 1 will manage this waterway for a natural setting. A retention VQO will be adopted for most of this viewshed (Semi-Remote or Remote Recreation). Alternative 3 will adopt partial retention and modification VQO's along much of this waterway, except the Cleveland Peninsula side where Old-growth Forest is applied. This part of the waterway will maintain its natural setting. Alternatives 2, 4, 5 and 6 will adopt partial retention and modification VQO's (Modified Landscape) throughout the viewshed. Alternative 9 will adopt a modification and maximum modification VQO for most the waterway (LUD IV) except the northern and southern end which is allocated to LUD III. Alternatives 7 and 8 adopt a modification and maximum modification VQO (Timber Production) for all of this waterway except the Old-growth Habitat LUD on the Cleveland Peninsula side in Alternative 8. Because in a few areas, particularly on the Revilla Island side, the impact of existing harvest has reached or exceeded the level allowed by the adopted VQO's, in all alternatives, further analysis may indicate that even-aged harvest will need to be reduced or deferred in these areas for the next 10-20 years.

Chatham Strait. Alternative 1 will manage all of this waterway in a natural setting. A retention and partial retention VQO will be adopted along this channel (Remote or Semi-Remote Recreation). Alternative 3 will adopt a foreground retention and middleground maximum modification VQO along most parts of the west side of this waterway (Scenic Viewshed and Timber Production), while other scattered portions will remain in a natural setting due to Old-growth Habitat allocations. Alternatives 2, 4, 5 and 6 will also adopt retention and maximum modification VQO's along much of the west side of this channel. Alternatives 7, 8 and 9 will adopt modification and maximum modification VQO's (Timber Production in Alternatives 7 and 8, LUD IV in Alternative 9) in most areas along the west of side of this channel except in the scattered areas where LUD II's or III's are allocated in Alternative 9 and Old-growth Habitat is allocated in Alternative 8. In a few areas, particularly between Peril Strait and Tenakee Inlet, the impact of existing harvest has reached or exceeded the level allowed by the adopted VQO's, in all alternatives, further analysis may indicate that even-aged harvest will need to be reduced or deferred in these areas for the next 10-20 years.

Cholmondely Sound. Alternative 1 will essentially adopt a retention VQO throughout this bay (Semi-Remote Recreation) except where very extensive harvest has taken place on the private lands along the southern shores of this viewshed. Alternatives 2, 3, 4, 5 and 6 all adopt partial retention and modification VQO's around Sunny Cove and the West Arm of the bay (Modified Landscape), and maximum modification throughout most of the rest of the bay (Timber Production - this portion also not a Priority Use Area). The exception to this is Alternative 3 where two Old-growth Habitat areas are allocated at the extreme southern portions of the Kitkun Bay and South Arm- Cholmondely Sound viewsheds. These segments of these viewsheds will remain in a natural setting. Alternative 9 would adopt retention and partial retention VQO's in the West Arm of the bay (LUD III) and maximum modification (LUD IV) in the remaining portions. Alternatives 7 and 8 would adopt a maximum modification VQO in most of the bay (Timber Production).

Clarence Strait. Alternative 1 would adopt a retention or partial retention VQO for most of this viewshed (Remote or Semi-Remote Recreation). Alternatives 3, 5 and 6 will result in the maintenance of a near natural setting along most of the east side of this waterway due to Wilderness or Old-growth Habitat allocations. The allocation of Modified Landscape and a few scattered Old-growth Habitat areas will result in the adoption of retention to modification visual objectives along the Prince of Wales side of this channel. Alternatives 2 and 4 will adopt a modification VQO on the Prince of Wales side of the waterway (Modified Landscape), and a retention or partial retention objective along most of the east side (Scenic Viewshed and Wilderness). Alternative 9 adopts a range of VQO's from partial retention to maximum modification along the west side (LUD III and LUD IV), and either retention or partial retention along the east side (LUD III and Wilderness). Alternatives 7 and 8 will result in the adoption of the maximum modification VQO along most of this channel, except where Alternative 8 allocates a few scattered Old-growth Habitat areas that will result in the maintenance of a natural setting. Because the impact of existing harvest in a few areas has reached or exceeded the level allowed by the adopted VQO's, particularly along the Prince of Wales side, in alternatives 2-6, further analysis may indicate that even-aged harvest will need to be reduced or deferred in these areas for the next 10-20 years.

Duncan Canal. Alternative 1 in effect adopts a retention objective throughout the viewshed (Semi-Remote Recreation). Alternatives 3, 5 and 6 adopt a retention VQO for much of the bay (Wilderness, Semi-Remote Recreation, two Old-growth Habitat areas). The rest of the viewshed has an adopted VQO of partial retention or modification (Scenic Viewshed or Modified Landscape). Alternatives 2 and 4 will result in a mix of allocations from Modified Landscape to Wilderness. Adopted VQO's will range from modification in some timber harvest LUD's to retention in the Duncan-Salt Chuck Wilderness. Alternative 9 will adopt a range of objectives from retention in the Wilderness to retention through maximum modification (LUD III and LUD IV) in the rest of the bay. Alternatives 7 and 8 adopt a modification or maximum modification objective throughout the bay (Timber Production) except in the Wilderness portion and in two areas allocated to Old-growth Habitat in Alternative 8. A natural setting is maintained in all these areas.

Eastern Passage. Due to the Semi-remote Recreation allocation throughout this viewshed, Alternative 1 adopts a retention VQO and maintains the area's natural setting. Alternative 3 adopts a retention VQO along most of this channel (four Old-growth Habitat allocations). Most of the rest of the viewshed has an adopted VQO of retention or partial retention (Scenic Viewshed). Alternatives 2, 4, 5, 6 adopt retention and partial retention VQO's throughout most of the viewshed (Scenic Viewshed or Semi-Remote Recreation). Alternative 9 adopts a retention and partial retention VQO along the northern half of the channel (LUD III), and modification and maximum modification along the southern half (LUD IV). Alternative 8 adopts a retention objective along major segments of this channel that are allocated to Old-growth Habitat, and modification and maximum modification throughout the rest of the viewshed (Timber Production). Alternative 7 adopts a modification and maximum modification VQO throughout the viewshed (Timber Production). Because the impact of existing harvest in a few areas (particularly just outside the north entrance to Blake Channel)has reached or exceeded the level allowed by the adopted VQO's, in alternatives 2-6 and 9, further analysis may indicate that even-aged harvest will need to be reduced or deferred in these areas for the next 10-20 years.

Ernest Sound. Alternative 1 will maintain all this viewshed in a natural setting (Wilderness, Remote or Semi-Remote Recreation). Alternative 3 also adopts a retention VQO throughout much of this channel (three Old-growth Habitat areas and Wilderness). The northern end adopts a range of VQO's from retention to maximum modification (Scenic Viewshed, Modified Landscape, Timber Production). Alternatives 5 and 6 adopts a range of VQO's from retention to maximum modification (Scenic Viewshed, Modified Landscape, Timber Production and one Old-growth Habitat area around Myers Chuck and Union Bay). Alternatives 2 and 4 adopt primarily a modification and maximum modification VQO along the south side of the channel (Timber Production), and retention on the north side of the channel due to the South Etolin Wilderness. Alternative 8 adopts a retention VQO along much of this waterway (three Old-growth Habitat areas and Wilderness). However, the north end adopts primarily a maximum modification VQO (Timber Production). Except for the Wilderness, Alternatives 7 and 9 adopt primarily a maximum modification VQO (Timber Production).

Frederick Sound. Alternative 1 will maintain all this viewshed in natural setting (Semi-Remote Recreation). Alternative 3 adopts VQO's of retention and partial retention for most of this waterway (four Old-growth Habitat areas and Scenic Viewshed and the Stikine LeConte Wilderness). A few areas along the water and other middle and background areas adopt a maximum modification VQO (Timber

Production). Alternatives 5 and 6 also adopt a retention VQO in two Old-growth Habitat areas and one Wilderness, and partial retention to maximum modification in the rest of the viewshed (Scenic Viewshed or Timber Production). Other than the Wilderness at either end of this channel Alternatives 2 and 4 adopt partial retention to maximum modification VQO's throughout the viewshed (Scenic Viewshed or Timber Production). Alternative 9 adopts primarily a maximum modification VQO (LUD IV) except for the one Wilderness and the few portions that are allocated to LUD III where the VQO would be retention and partial retention respectively. Alternatives 7 and 8 adopt a maximum modification VQO (Timber Production) for all of this viewshed except for one Wilderness in 7, and this Wilderness and four Old-growth Habitat areas in 8, where the VQO is retention.

Hyder/Salmon River Highway. Alternatives 1-6 and 9 allocate this area to Scenic Viewshed, and hence adopt VQO's of retention and partial retention. Alternatives 7 and 8 allocate this area to Semi-Remote Recreation, and in effect adopt a VQO of retention throughout the viewshed.

Icy Strait. Alternative 1 allocates this viewshed to Semi-Remote Recreation thereby adopting in effect a retention VQO for this area and maintaining the natural setting of the area outside the extensive private lands on the Chichagof Island side of the channel. Alternative 3 adopts a retention VQO in four scattered Old-growth Habitat areas. The rest of the viewshed has an adopted VQO of partial retention to maximum modification (Scenic Viewshed and Timber Production). Alternatives 5 and 6 adopt a retention VQO in only one Old-growth Habitat area and a partial retention to maximum modification VQO in the rest of the viewshed (Scenic Viewshed and Timber Production). Alternatives 2 and 4 adopt primarily a partial retention VQO along the immediate shoreline and a maximum modification VQO in the middleground and background portions of this viewshed (Scenic Viewshed and Timber Production). Alternative 9 adopts primarily a maximum modification VQO on the south side of the channel (LUD IV) and a partial retention VQO on the north side of the channel (LUD III). Alternative 8 adopts a maximum modification VQO throughout the viewshed (Timber Production) except for the four Old-growth Habitat areas where retention is the VQO. Alternative 7 adopts maximum modification on the south side of the channel (Timber Production) and modification on the north side of the channel (Modified Landscape).

Lynn Canal. Alternative 1 adopts a retention or partial retention VQO throughout the viewshed (Remote or Semi-Remote Recreation). In Alternative 3 several large Old-growth Habitat areas along this channel result in an adopted VQO of retention. Most of the rest of this viewshed has an adopted VQO of retention or partial retention (Scenic Viewshed and Semi-Remote Recreation). Alternatives 2, 4, 5 and 6 adopt primarily a retention or partial retention VQO for this waterway (Scenic Viewshed or Semi-Remote Recreation) except for one portion (Berners Bay to Sullivan Island) that is allocated to Modified Landscape where the adopted VQO is modification. Alternative 9 adopts a retention VQO for more than half of the viewshed due to the LUD II allocation for much of this area. The adopted VQO for most of the rest of the channel is partial retention. Alternative 8 adopts a retention VQO in the five scattered Old-growth Habitat reserves. Along most of the rest of the waterway the adopted VQO is modification. Alternative 7 allocates almost all of this viewshed to Modified Landscape, and hence adopts a modification VQO for most of the area.

Mendenhall Glacier. Alternatives 1-6 allocate this viewshed to a combination of Special Interest Area, Semi-Remote and Remote Recreation, and hence adopt a retention VQO for most of this area. Alternative 9 allocates this area in a similar way and adopts a retention to partial retention objective. Alternatives 7 and 8 allocate this area similarly to Alternatives 1-6 except for a small area around the Mendenhall Glacier Special Interest Area that is allocated to Timber Production where the adopted VQO is modification and maximum modification.

Peril Strait - Olga Strait - Sitka. Alternative 1 in effect adopts a retention VQO for the entire viewshed (Semi-Remote Recreation). Alternative 3 adopts a retention VQO in the four Old-growth Habitat areas along Peril Strait and the Remote Recreation allocation along the Neva Strait - Olga Strait portion of this waterway. Along the rest of this channel these alternatives adopt a partial retention VQO along the immediate shoreline and maximum modification in the middleground and background zones (Scenic Viewshed and Timber Production). Alternatives 2, 4, 5 and 6, which have no Old-growth Habitat allocations in this area, adopt the partial retention and maximum modification VQO's along most of the waterway in the same way as Alternative 3. These alternatives also adopts the retention objective along the western narrow portion of the waterway (Remote Recreation). Alternative 9 adopts a maximum modification VQO along the wider eastern portion of this channel (LUD IV), and retention and partial retention along the Poison Cove to Sitka portion of this channel (LUD III). Alternative 8 adopts a retention VQO in scattered portions of the viewshed (Old-growth Habitat), retention in the Neva Strait - Olga Strait portion of this channel (Semi-Remote Recreation), and maximum modification throughout the remainder of the channel (Timber Production). Alternative 7 adopts the maximum modification VQO throughout most of this viewshed (Timber Production) except the Neva Strait - Olga Strait portion where the adopted VQO is retention (Semi-Remote Recreation). Because the impact of existing harvest in a few areas (particularly the Sitkoh Bay/False Island areas) has reached or exceeded the level allowed by the adopted VQO's, in alternatives 2-6, 9, and Alternative 7, further analysis may indicate that even-aged harvest will need to be reduced or deferred in these areas for the next 10-20 years.

Salmon Bay Lake. Alternative 1 adopts a retention VQO (LUD II and Semi-Remote Recreation). Alternatives 3, 5 and 6 would adopt retention and partial retention VQO's. In these alternatives the LUD II area is allocated to Old-growth Habitat, and the rest of the area is allocated to Scenic Viewshed where timber harvest would be allowed. Alternatives 2 and 4 in effect adopt the same retention and partial retention VQO's (LUD II and Scenic Viewshed). Alternative 9 adopts a retention objective in the LUD II area around the lake and a partial retention VQO in the LUD III allocated to the rest of the viewshed. Alternatives 7 and 8 also essentially adopt a retention VQO for most of the foreground (LUD II or Old-growth Habitat), and maximum modification for rest of the viewshed (Timber Production).

Stephens Pass. Alternative 1 adopts a retention VQO along the east side of the channel (Semi-Remote Recreation). Alternative 3 adopts retention objective in a few scattered areas along the east side (Old-growth Habitat) and partial retention in most of the remaining viewshed (Scenic Viewshed). Alternatives 2, 4, 5 and 6 adopt a partial retention objective along most of the east side of the channel (Scenic Viewshed). Alternative 9 adopts primarily a partial retention VQO along the northern half of this channel (LUD III), and primarily a maximum modification VQO along the southern half (LUD IV). Alternative 8 adopts a maximum modification VQO along all of the east side except in the scattered Old-growth Habitat areas where the VQO is retention. Alternative 7 adopts a maximum modification VQO along the east side of the channel (Timber Production). In all alternatives a retention VQO is adopted along the west side (Kootznoowoo Wilderness).

Stikine Strait. Alternative 1 adopts a retention VQO throughout this viewshed (Semi-Remote Recreation). Alternative 3 adopts a retention VQO along part of the north side of this channel (Old-growth Habitat), and a partial retention VQO for the rest of the viewshed (Scenic Viewshed). Alternatives 2, 4, 5, 6 and 9 adopt a partial retention VQO for almost all this viewshed (Scenic Viewshed for Alternative 2, 4, 5 and 6; LUD III for Alternative 9). Alternative 8 adopts a maximum modification VQO for all this viewshed except the portion along the north shore that is allocated to Old-growth Habitat and has a retention VQO. Alternative 7 adopts a maximum modification VQO for the entire viewshed (Timber Production). Because the impact of existing harvest in a few areas (in particular, eastern Zarembo Island and western Woronkofski Island) has reached or exceeded the level allowed by the adopted VQO's, in all alternatives, further analysis may indicate that even-aged harvest will need to be reduced or deferred in these areas for the next 10-20 years.

Sumner Strait. Alternative 1 adopts a retention VQO along most of this waterway (Semi-Remote Recreation and LUD II). Alternatives 3, 5 and 6 adopt a range of VQO's including two Old-growth Habitat areas and LUD II's, partial retention along some foreground portions of the Prince of Wales shoreline, modification in the middleground and background portions of the Prince of Wales side (Modified Landscape), and partial retention in the Mitkoff/Zarembo Island area (Scenic Viewshed). They adopt a maximum modification VQO along most of the Kupreanof side of the waterway (Timber Production). Alternatives 2 and 4 adopt roughly the same set of VQO's as Alternatives 3, 5 and 6 except that no Old-growth Habitat areas are allocated in these alternatives. Alternative 9 adopts a retention objective around the Calder Mountain/Shakan Strait area (LUD II), a partial retention VQO around Port Protection and Red Bay (LUD III), and a maximum modification VQO throughout the rest of the viewshed (LUD IV). Alternatives 7 and 8 adopt a maximum modification VQO throughout the viewshed except in the LUD II areas and in the Old-growth Habitat areas in Alternative 8 where the VQO is retention. Because the impact of existing harvest in a few areas (particularly at the north end of Prince of Wales Island) has reached or exceeded the level allowed by the adopted VQO's, for all alternatives, further analysis may indicate that even-aged harvest will need to be reduced or deferred in these areas for the next 10-20 years.

Sweetwater Lake/Honker Divide. Alternative 1 in effect adopts a retention VQO for all of the Sweetwater Lake/Honker Divide area (Scenic River and Semi-Remote and Remote Recreation). Alternatives 5 and 6 adopt a retention or partial retention VQO for most of the undeveloped core of the Honker Divide canoe route to just below Thorne Lake (Old-growth Habitat), and retention and partial retention for the Thorne River portion (Scenic River and Recreational River). Alternative 3 adopts a retention objective for most of the central portion of the canoe route from Butterfly Lake to Thorne Lake (Old-growth Habitat) and retention and partial retention for most of the rest of the viewshed (Scenic River, Recreational River, Scenic Viewshed). Most of the rest of this viewshed has an adopted VQO of partial retention (Scenic Viewshed). Alternatives 2 and 4 adopt a retention VQO for most of foreground portion of this viewshed (Scenic River) and a partial retention objective for most of the rest of the viewshed (Scenic Viewshed). Alternative 9 adopts a retention and partial retention VQO for most of the viewshed (LUD III). Alternative 8 adopts a retention objective for the central undeveloped portion of the canoe route (Old-growth Habitat) and modification and maximum modification for the rest of the viewshed (Timber

Production). Alternative 7 adopts a modification and maximum modification objective for the entire viewshed (Timber Production). Because the impact of existing harvest in a few areas (in particular, portions of Sweetwater and Hatchery Lakes) has reached or exceeded the level allowed by the adopted VQO's, in alternatives 2-6 and 9, further analysis may indicate that even-aged harvest will need to be reduced or deferred in these areas for the next 10-20 years.

Tenakee Inlet to Tenakee Springs. Alternative 1 in effect adopts a retention VQO for most of the viewshed (Semi-Remote Recreation). Alternatives 3, 5 and 6 adopt a retention VQO for most of the north side of the inlet (Old-growth Habitat) and maximum modification (Timber Production) for most of the south side of the inlet except for the LUD II areas. Alternatives 2 and 4 adopt a maximum modification VQO throughout most of the viewshed except for narrow shoreline strips that have an adopted VQO of partial retention (Scenic Viewshed) or modification (Modified Landscape) and the areas that are allocated to LUD II. Alternative 9 adopts a retention and partial retention objective for the north side of the inlet (LUD III) and primarily a maximum modification VQO for the south side (LUD IV) except where a LUD II is allocated. Alternative 8 adopts a retention VQO on the north side of the inlet (Old-growth Habitat) and primarily a maximum modification VQO on the south side except in the portions allocated to LUD II. Alternative 7 adopts a maximum modification VQO throughout the viewshed (Timber Production) except where a LUD II is allocated. Because the impact of existing harvest has reached or exceeded the level allowed by the adopted VQO, in alternatives 2-6 and 9, further analysis may indicate that even-aged harvest will need to be reduced or deferred in these areas for the next 10-20 years.

West Coast Waterway/Prince of Wales Island. Alternative 1 in effect adopts a retention VQO (LUD II and Semi-Remote Recreation) throughout this waterway. Alternatives 3, 5 and 6 adopt a wide range of VQO's including retention in the areas allocated to Old-growth Habitat and LUD II, partial retention in the foreground zones in Calder Bay and along the north side of Dry Pass (Modified Landscape), and modification and maximum modification throughout the rest of the viewshed (Timber Production). Alternatives 2 and 4 allocate no Old-growth Habitat areas, and hence the only portions of the viewshed with an adopted VQO of retention is the LUD II area at the north end of the waterway. The north side of Dry Pass and Shakan Bay has an adopted VQO of partial retention and modification (Modified Landscape), and the rest of viewshed adopts a modification or maximum modification VQO (Timber Production). Alternative 8 adopts a retention VQO in the LUD II area at the north end of the waterway and in three scattered Old Growth Habitat areas. The rest of the viewshed has an adopted VQO of modification and maximum modification (Timber Production). Alternatives 7 and 9 adopt a retention VQO only in the north end (LUD II). The rest of viewshed has an adopted VQO of modification and maximum modification (Timber Production in Alternative 7 and LUD IV in Alternative 9). Because the impact of existing harvest in a few areas (Calder Bay, Dry Pass, and Staney Creek/Twin Peaks) has reached or exceeded the level allowed by the adopted VQO's, in all alternatives, further analysis may indicate that even-aged harvest will need to be reduced or deferred in these areas for the next 10-20 years.

Wrangell Narrows. Alternative 1 adopts a retention VQO along all of this waterway (Semi-Remote Recreation). Alternatives 3, 5 and 6 adopt a retention VQO in a couple of Old-growth Habitat areas, and retention and partial retention VQO's for the rest of the viewshed (Scenic Viewshed). Alternatives 2, 4 and 9 adopt retention and partial retention VQO's throughout most of the viewshed (Scenic Viewshed in Alternative 2 and 4 and LUD III in Alternative 9). Alternative 8 adopts a retention

VQO in two Old-growth Habitat areas, but most of the viewshed has an adopted VQO of modification and maximum modification (Timber Production). Alternative 7 adopts a modification and maximum modification VQO throughout the viewshed (Timber Production). Because the impact of existing harvest in a few areas (particularly the moddle portion of the Mitkof Island side of this waterway) has reached or exceeded the level allowed by the adopted VQO's, in all alternatives, further analysis may indicate that even-aged harvest will need to be reduced or deferred in these areas for the next 10-20 years.

Zimovia Strait. Alternative 1 adopts a retention VQO throughout the viewshed (Semi-Remote Recreation). Alternative 3 adopts a retention VQO in a couple of small Old-growth Habitat areas and retention and partial retention along the rest of the waterway (Scenic Viewshed). Alternatives 2, 4, 5 and 6 adopt retention and partial retention VQO's throughout most of the viewshed (Scenic Viewshed) except for the west side of the channel's north end which is allocated to Modified Landscape and the east side of the south end which is allocated to Timber Production. In these areas modification and maximum modification are the predominant adopted VQO's. Alternative 9 adopts primarily a retention and partial retention VQO along the east side of this waterway (LUD III) and modification and maximum modification VQO along the west side of the channel (LUD). Alternative 8 adopts a retention VQO in the two small Old-growth Habitat areas along this channel and modification and maximum modification throughout the rest of the viewshed (Timber Production). Alternative 7 adopts modification and maximum modification VQO's throughout the viewshed (Timber Production). Because the impact of existing harvest in a few areas (particularly on Wrangell Island just south of Chichagof Pass) has reached or exceeded the level allowed by the adopted VQO's, in all alternatives, further analysis may indicate that even-aged harvest will need to be reduced or deferred in these areas for the next 10-20 years.

Visual Priority Travel Routes and Use Areas

As discussed in the 1991 SDEIS, in 1980 the Forest inventoried all travel routes and use areas using the process outlined for the Visual Management System (USDA Handbook #462). This inventory provides a method of measuring the importance of viewed landscapes as well as the level of concern the viewer has towards the landscape. Sensitivity levels are then assigned to each travel route or use area.

The 1990 DEIS and 1991 SDEIS directed special visual management associated with sensitive travel routes and use areas, through the application of the Scenic Viewshed, Modified Landscape, and Wild, Scenic, or Recreational River LUD's. The Timber Production LUD also set some visual management guidelines. The Proposed Revised Forest Plan (Appendix F) now designates the travel routes and use areas to which adopted visual quality objectives will be applied.

Using the inventoried Sensitivity Level 1 and 2 travel routes and use areas as a starting point, the Forest Supervisors selected the routes and areas which provide the viewpoints for the attainment of the adopted VQO's. Their selections were based on judgments about the relative importance of destination points vs. routes to destination points, the types of viewers using routes, and the existing visual condition of the area. The resulting list is organized by Administrative Area, Ranger District and category of use, and is located in Appendix F of the Forest Plan. This list does not alter the designation of sensitivity level 1 and 2 areas in the Forest's resource inventory for scenery. This inventory remains a source of information for managers.

If a route was not selected as a Visual Priority Travel Route or Use Area, the area seen from these routes or areas would in effect be treated as a seldom-seen area, and the least restrictive VQO of maximum modification would be the applicable standard in most seldom-seen areas. All areas, whether seen from a priority route or use area or not, are subject to this minimum standard.

Small plane routes, as well as major airline routes, were not included on the Visual Priority list (Appendix F). The rationale for this is based on the concept of destination-oriented recreation experiences: it is the landscape setting at the destination that should be managed for scenic quality, not necessarily the aerial route travelled to get there.

Most recreation places, communities, cabins, trails, other developed recreation sites, major roads, boat routes, and anchorages and saltwater use areas are listed as Visual Priority Travel Routes and Use Areas. Though not included as Priority Routes, most of the tourist or flightseeing routes of the Tongass pass over areas that will appear essentially unaltered: icefields, rock and water, Wilderness or Natural Setting designations. Other small plane routes are primarily commuter related. Some of the tourist and commuter routes fly over forest lands where timber harvest activities are a dominant feature.

Other specific travel routes and use areas that are designated level 1 or 2 in the visual resource inventory, but are not included on the priority list, are on Prince of Wales Island. These areas include:

1. All of the main road system north of Control Lake and north of the Sandy Beach picnic site. (Main road from Control Lake to Thorne Bay to Sandy Beach and all main roads to the south are included on the list).
2. Labouchere Bay community.
3. Ratz Harbor and Lancaster Cove anchorages.
4. All of Trocadero Bay (other than head of bay)
5. Cholmondeley Sound (other than West Arm and Sunny Cove)
6. Twelvemile Arm (other than the head of the bay and the area around Hollis and along Alaska Marine Highway route into Hollis).

Much of the landscape around the above locations has been heavily modified by past Forest Service harvest or private Native corporation harvest.

Soils

Affected Environment

Soils in Southeast Alaska develop in parent materials originating from a variety of geological or vegetative sources. Parent material is the inorganic or organic matter in which soils develop, and includes volcanic ash, glacial deposits, colluvium, stream and uplifted marine sediments, rock, and deposits of decomposed plant materials. Soils are commonly divided on the basis of their parent material. Both mineral and organic soils occur extensively within the Tongass, where over 100 different kinds of soils have been identified. Soils cover 84 percent of the inventoried land surface area of the Tongass; the remainder consists of ice, exposed bedrock, and bodies of water.

From a resource management perspective, soil productivity - that is, a soil's ability to support vegetative growth - and the potential loss of soils or off-site effects from erosion and landslides are the principle concerns. The productivity of soils directly or indirectly affects the productivity of other forest resources. Tree growth, wildlife and fish habitat quality, and recreation uses and potentials are in part dependent on the quality of the soils. In Southeast Alaska, soil productivity, in terms of tree growth, is high on well drained soils, and decreases as latitude and elevation increase and as drainage becomes poorer.

Soil, or site, productivity is generally measured by the rate of biomass accumulation, and site index is commonly used to give a relative indication of this productivity. Site index is determined by the height of dominant trees at a specified age. The site index tables or curves available for use in Southeast Alaska were developed from trees in even-aged stands, not the uneven-aged or old-growth stands which predominate here, and consequently there are few satisfactory sites for determining site index. Alternatively, soil productivity can be estimated from the characteristics of individual soil types. The principal characteristics are soil depth, drainage, and coarse fragment content.

Soil erosion in the form of gully, sheet or rill erosion is a minor occurrence under natural, undisturbed conditions in Southeast Alaska, because the thick surface duff layers that cover the mineral soils protect them from surface erosion. Mineral soils can be disturbed and exposed either by natural causes, such as landslides and blowdown, or management activities, such as timber harvest and road construction. Surface erosion can become active once the duff layer is removed and until revegetation occurs. Maximum sediment production occurs within the first five years after exposure, returning to background levels in approximately ten years as the vegetation re-grows.

Landslides, both naturally-occurring and human-caused, dominate soil movement processes on steep forest lands in Southeast Alaska. Landslides deliver eroded material to streams more quickly, and in greater quantity, than surface erosion. Landslides can seriously retard soil productivity for forest regeneration by removing the soil mantle down to bedrock or glacial till, and then depositing the debris over productive soils on lower slopes and valley bottoms. It can take between 50 to 100 years for the nitrogen and organic soil layers to be rebuilt in landslide areas.

Landslides are thought to be an important natural process by which stream substrates are replenished. Sediments, including gravels, are deposited in stream headwater areas. The sediments are then transported through the stream system during which time many of the gravels become available as fish spawning habitat. The frequency of delivery and quantity of the material delivered will determine the effect (either positive or negative) landslides will have on stream channels and fish habitat. It is generally though that increased frequency of slides and quantity of material delivered, above the natural range of occurrence, moves the streams out of equilibrium and degrades fish habitat.

A recent study of landslides occurring between 1963 and 1983 (Swanston, 1989) in Southeast Alaska showed that roughly ten percent (118) happened in clearcut harvest areas or were directly associated with timber harvesting, whereas roughly 90 percent (1,277) happened in unlogged areas. On a per-acre basis, however, landslides occurred in clearcut areas about three times as frequently as in unlogged areas. Landslides in unlogged areas appear to be larger and longer than those in logged areas. Of the 1,277 landslides occurring on unlogged areas, 37 affected fish streams, while 7 of the 118 landslides occurring on logged areas had an effect.

Environmental Consequences

Forest management activities can cause soil erosion through the exposure of mineral soil and can reduce forest soil productivity through the placement of rock material over otherwise productive areas. The management activities that have the greatest potential to affect soil erosion, including sheet, rill, gully or mass movement erosion, are timber harvest-associated activities such as road and log-landing construction, rock pit development, and some yarding methods.

Due to the considerable amount of vegetative groundcover remaining on the harvest units during and following timber harvest, erosion from these areas is usually small. However, with inappropriate practices, water-caused soil erosion can occur, especially where management activities have exposed extensive areas of mineral soils or where cable or shovel yarding has caused trenches which can concentrate water flow. Wind erosion is practically non-existent on harvest units. Blowdown (or “windthrow”) can increase along the edges of harvest units, and this may expose mineral soil. Blowdown increases the potential for soil erosion, and may increase the potential for landslides.

Preliminary information suggests that blowdown or windthrow is thought to have a positive effect on soil productivity through the periodic mixing of the soil horizons (horizontal soil layers). In the absence of windthrow nutrients tend to accumulate in the organic soil horizons, where they become immobilized (not moving down into the inorganic layers). Over time this leads to nutrient deficiencies (Bormann et al., in press). Windthrow, and disturbances that mimic windthrow, counter this tendency by overturning and mixing the soil horizons and re-mobilizing the nutrients.

Therefore clearcut logging, and successive harvests ("rotations") without soil disturbance by windthrow, is thought to cause a site to become progressively less productive. Alternative harvest practices (uneven-aged and two-aged management), and longer harvest rotations, are more likely to maintain soil productivity as blowdown of single trees or clumps occurs. Alternatives 2, 7 and 9 all use even-aged, short-rotation harvesting, and are most likely to lead to decreasing soil productivity over time. Alternatives 1, 4 and 5 use primarily uneven-aged management and longer rotations, and would best maintain soil productivity relative to blowdown frequency. Alternatives 3, 6 and 8 use two-aged and uneven-aged management with shorter rotations,and thus fall somewhere in between the extremes.

Soil productivity decreases from the construction of roads because land is taken “out of production” (covered over or compacted). Erosion increases from the construction of roads because cuts and fills, and road surfaces, lack a protective vegetative cover; erosion can also occur if road construction causes landslides.

The amount of road construction by alternative is used as a measure of both soil productivity losses and erosion potential. The actual amount of erosion caused by roads is not known or reliably quantifiable, but the differences in acres disturbed by roads is a good indication of how site-specific effects are likely to vary between alternatives. These site-specific effects are evaluated more precisely during project planning, based on the specific conditions found at the project site, and will vary based on soil parent materials, slope, location within a watershed, mass movement hazard, and other factors. Table 3-45 displays “cumulative roaded acres” - the total amount of land area covered by roads at a point in time. “Current roaded acres” is the cumulative amount as of 1995. The amount of new roads estimated to occur by alternative is added to this amount to get the total cumulative roaded acres at the end of decade 1 (10 years after the Revised Forest Plan is approved) and at the end of decade 5 (50 years after the Revised Forest Plan is approved).

Compared to either the Forest-wide acreage, or to the acreage within the Moderate and Intensive Development LUD’s, the cumulative roaded acres of the alternatives is quite small, and shows little difference between them. This may not be the case within individual watersheds, and a more intensive watershed analysis may be done at the project level.

Table 3-45
Current cumulative roaded acres, and by alternative at the end of decades 1 and 5

Alt.	Current Cumulative Roaded Acres [1]	Cumulative Acres at End of Decade 1	Cumulative Acres at End of Decade 5
1	13,950	13,950	13,950
2	13,950	19,323	32,310
3	13,950	17,586	24,303
4	13,950	15,849	18,951
5	13,950	15,756	18,684
6	13,950	18,681	27,585
7	13,950	22,899	41,448
8	13,950	18,744	27,684
9	13,950	21,879	38,568

[1] Total acres covered by roads as of 1995. Roaded acres are calculated based on an average of three acres per one mile of road.

Soil mass movements (such as slumps, earthflows, debris avalanches, and debris flows), constitute the most potentially damaging type of erosion. They are thought to be the major cause of accelerated erosion resulting from resource management activities. Landslides may negatively affect soil quality. They have the potential to affect aquatic habitats both positively and negatively: positively, by providing new sources of woody debris and gravel; negatively, by over-loading streams which can result in a loss of pool habitat for fish.

The landslide frequency information described below is used to predict future landslides, and correlates with the acres of timber harvest projected for each alternative. Estimated landslide occurrence from timber-related management is shown for the first decade, and cumulatively for decades1-5, in Table 3-46. Additional mitigation measures are now in place that were not used during the period of the landslide study (for instance, riparian standards and guidelines, the removal of extreme hazard soils from the suitable land base, and Best Management Practices). Landslide frequencies are anticipated to actually be lower for each alternative than those displayed in the table. The landslide study was based primarily on clearcut logging; comparability to other logging systems is not known.

Table 3-46
Projected timber harvest acres and estimated increased landslide frequency[1]

	Decade 1			Decades 1-5		
		Estimated Landslides			Estimated Landslides	
Alt.	Acres Harvested	Harvest Areas	Non-Harvest Areas [2]	Acres Harvested	Harvest Areas	Non-Harvest Areas [2]
1	0	0	0	0	0	0
2	167,672	75	25	870,519	389	130
3	94,338	42	14	495,704	221	74
4	49,432	22	7	258,391	115	38
5	47,120	21	7	242,006	108	36
6	123,178	55	29	645,008	288	96
7	232,414	104	35	1,227,398	548	182
8	123,253	55	18	640,880	286	95
9	177,477	79	26	923,918	412	137

[1] Based on an average of one landslide for every 2,240 acres of timber harvesting. See text for explanation.
[2] Estimated number of natural landslides expected from similar landbase with no timber harvest activities. Alternative 1 has no acres scheduled for timber harvesting.

Mitigation

Forest-wide standards and guidelines for the soils resource are used in all alternatives (see Proposed Revised Forest Plan, Chapter 4), and will apply to all site-specific projects. Forest-wide standards and guidelines are followed to mitigate the effects of management activities. They are designed to minimize accelerated soil erosion and maintain long-term soil productivity. They include soil conservation practices and incorporate the applicable Best Management Practices (BMP's) (see Appendix C of the Proposed Revised Forest Plan). Annual monitoring of BMP's helps ensure that water quality goals, and standards and guidelines, are met during project implementation (see Proposed Revised Forest Plan, Chapter 6).

Special Interest Areas

Affected Environment

Special Interest Areas are areas possessing unique or unusual scenic, historic, prehistoric, scientific, natural or other characteristics. The objective of designating and managing such areas is to protect their unique values and, where appropriate, to foster public use and enjoyment of these areas. Special Interest Areas may be designated as scenic, recreation, historic, archaeological, geological, botanical, zoological or paleontological areas. Special Interest Areas differ from Research Natural Areas in that management may promote public use as well as scientific study.

Special Interest Area designations are intended to maintain natural to near-natural conditions in most cases; the Recreation Area designation may include developed facilities within a natural or near-natural setting. The resources contained within these areas are not available for development, except for public facilities designed to allow recreation use while protecting the values of the area, or for interpretation and scientific study. Each area may require unique management direction, determined through individualized study and planning. Special Interest Areas may be withdrawn from mineral entry. The land use designation for Special Interest Areas applies to all the designated areas.

Seven Special Interest Areas have been previously designated within the Tongass National Forest. These are described in the 1991 SDEIS. An analysis of areas suggested in public comments or identified internally has led to a list of sixteen potential Special Interest Areas. Fourteen of these were described in the 1991 SDEIS. Two additional areas were added since that time, Duke Island and Falls Creek Windthrow, and these are described here.

> **Duke Island Zoological Area**. Duke Island has a unique topography, with many potholes that rarely freeze in the winter. It is extensively used by wintering waterfowl, including trumpeter swans. Duke and surrounding islands are used by marine mammals as haul outs.
>
> **Falls Creek Windthrow Botanical Area**. This is an even-aged stand of spruce and hemlock on Mitkof Island that originated after a large windthrow event about 200 years ago. The soils are highly productive, and the area represents a good opportunity for study of an unmanaged second-growth forest.

Quite recently the Pack Creek Research Natural Area has been proposed for de-listing, to be replaced by a similar area on Admiralty Island (see Research Natural Areas). Part of the proposal is to continue management of Pack Creek as a zoological area. Because this area is currently under RNA management, changing the designation to an SIA will have essentially no effect. For the purposes of this analysis, Pack Creek can be considered an existing special interest area.

Environmental Consequences

Existing Special Interest Areas will be protected from the effects of adjacent management activities under all alternatives. No adverse effects on existing areas are anticipated.

All 16 potential Special Interest Areas are recommended for classification under Alternatives 1-6. Upon approval of the final revised Forest Plan, these areas will be managed under the Special Interest Areas land use designation. Their unique features will be preserved, and opportunities for public and scientific use maintained. No areas are recommended under Alternative 9, and under Alternatives 7 and 8, two areas (Blue River and Patterson Glacier) are recommended for classification. Non-classified areas included in Natural Setting or Wilderness LUD's would retain their unique values; these include Bailey Bay, Duke Island, part of Soda Bay, and most of the Ward Lake expansion.

Some areas allocated to Moderate or Intensive Development could lose the values for which they have been identified if timber harvest and associated road construction occurs, while other areas not so affected are likely to retain their values. The areas likely to be significantly adversely affected over time (under Alternatives 7-9) are: Blind Slough, Keku Islets, Arena Cove/Cape Felix, and Soda Springs. Forest-wide standards and guidelines will apply to Caves and Karst associated features under Alternatives 7 and 8, but some karst ecosystem values could be affected. Alternative 9 would only require protection for caves (and not necessarily associated karst systems) as specified by the Federal Cave Resources Protection Act. However, most projects in recent years have also recognized the values of karst areas.

Classifying some or all of the Special Interest Areas could limit or adversely affect resource opportunities such as timber harvesting or, in some cases, mineral development. The two areas recommended under Alternatives 7 and 8 are not likely to cause any such effects. Under Alternatives 1-6, the majority of the areas would be recommended for withdrawal from mineral entry (not included would be Clear River, Fish Creek, Mt. Edgecumbe, and Pike Lakes); none are known to have mineral reserves of high development potential. About half the areas would be closed to off-highway vehicle (OHV) use, but areas currently popular for OHV use (Mt. Edgecumbe, Patterson Glacier and Ward Lake) would not be closed. Approximately 20,750 acres of tentatively suitable timberlands would not be available.

Subsistence

Affected Environment

Subsistence hunting, fishing, trapping and gathering activities represent a major focus of life for many Southeast Alaskan residents. Some individuals participate in subsistence activities to supplement personal income and provide needed food. Others pursue subsistence activities to perpetuate cultural customs and traditions. Still others participate in subsistence activities for reasons unconnected with income or tradition. For all these individuals, subsistence is a lifestyle reflecting deeply held attitudes, values and beliefs.

Within the context of Southeast Alaska's highly seasonal and cyclical resource-based employment, subsistence harvest of fish and wildlife resources takes on special importance. The use of these resources may play a major role in supplementing cash incomes during periods when the opportunity to participate in the wage economy is either marginal or nonexistent. Due to high prices of commercial products provided through the retail sector of the cash economy, especially in remote communities, the economic role of locally-available fish and game takes on added importance.

The opportunity to participate in subsistence activities reinforces a variety of cultural and related values in both Native and non-Native communities. For example, distribution of fish and wildlife contributes to the cohesion of kinship groups and to community stability through sharing of resources derived through harvest activities. Subsistence resources provide the foundation for Native culture, ranging from the totemic basis of clan divisions, to norms governing the distribution of wealth in potlatch ceremonies, to reinforcement of basic values of respect for the earth and its resources.

Section 803 of the Alaska National Interest Lands Conservation Act (ANILCA) defines subsistence use as "the customary and traditional uses by rural Alaska residents of wild renewable resources for direct, personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade." ANILCA provides for "the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives, on the public lands." It also states, in part, that "customary and traditional" subsistence uses of the renewable resources "shall be the priority consumptive uses of all such resources on the public lands of Alaska."

Protection of and access to subsistence resources such as salmon, deer, moose and other species and traditional gatherings has been attained by maintenance of habitat for each species. All land use designations (LUD's) proposed for the Tongass Land Management Plan Revision provide for the use of and access to subsistence resources, although the extent of available resources varies between LUD's and between alternatives.

The 1991 SDEIS discusses historical subsistence uses by Alaska Natives, including native cultural ties and the role of clan boundaries. It also discusses current uses by rural residents, both Alaska Native and non-native. Only the approximately 40 percent of Southeast Alaska's population not living in Juneau and Ketchikan are considered "rural" residents under the ANILCA definition of subsistence. The Communities section of Chapter 3 discusses each subsistence community, and the subsistence uses important to that community.

In making a subsistence evaluation and determination under ANILCA (see Environmental Consequences), the potential effects to subsistence resources are measured in terms of their abundance and distribution, opportunities for access, and the competition for them. The following summarizes the background and current situation of subsistence resources Forest-wide, in terms of these three elements, based on the 1991 SDEIS.

Abundance and Distribution

Eighty-five percent of rural Southeast households harvest subsistence food. In 1987 (a year for which extensive survey information is available, as discussed in the SDEIS), half of all households (51 percent) reported harvesting more than 80 pounds of edible subsistence product per capita. A quarter of all households harvest more than 250 pounds per capita. Residents not only use subsistence products for much of their food, they also tend to harvest many types of subsistence resources. More than half of all households (61 percent) harvested at least four different types of fish, wildlife, and/or plant resources in 1987.

The diversity of most resource harvest activities does not vary greatly by size of place, income, length of residence, or ethnicity. However, certain resources (for example, sea otters and seals) may only be taken by Alaska Natives. Forest-wide, however, there is a slight tendency for households located in small communities, and households with lower incomes, to harvest a greater variety of resources than other households.

Sitka black-tailed deer are important subsistence resources for Southeast Alaska's rural residents. In 1987, deer constituted 21 percent of the total pounds of subsistence resource harvested by rural residents with an estimated 11,600 deer being harvested by 3,000 households. Over one-third (37 percent) of all rural households harvested at least one deer. Land mammals other than deer account for only four percent of the total harvest of edible subsistence resources. These mammals include moose, black bear, and furbearers. The only marine mammal harvested for its meat by rural Southeast residents is the harbor seal (only available to Alaska Natives); it accounts for three percent of the total subsistence harvest.

Harvests of all salmon species constitute 21 percent of the total pounds of harvest of subsistence resources. More than 1.2 million pounds of edible salmon were harvested in 1987, and more than half of all households in rural Southeast Alaska harvested at least one salmon. Finfish other than salmon account for 24 percent of the total subsistence harvest. These include halibut, cod, flounder, sole, rockfish, herring, steelhead, trout and Dolly Varden. Halibut is the most commonly harvested finfish other than salmon with 48 percent of all households catching one or more halibut in 1987. Like salmon, halibut is a widely exchanged resource.

Bird harvest constitutes a negligible percentage of total subsistence harvest in pounds. Marine invertebrates constitute 16 percent of the total pounds of subsistence harvest in Southeast, with almost half of the rural Southeast residents harvesting them in 1987. Clams and cockles (32 percent), and dungeness crab (28 percent), are the most commonly harvested species. Plant products account for three percent of the total pounds of subsistence harvest. Berries of various types make up the largest component of the plant harvest. More edible plants are harvested by the residents of smaller communities, by low income households, and by Natives. Firewood is also an important component of the plant resources: 46 percent of all rural Southeast Alaska households harvested an estimated total of 26,000 cords of firewood in 1987.

Access

Most of Southeast Alaska's rural communities are accessible only by air and water. While several are served by the Alaska Marine Highway System, only Skagway, Haines, Hyder and Kluckwan have access to the continental mainland (via Canada). Roading, usually in conjunction with timber harvesting, is an important agent of change, providing greater access to areas previously unconnected to communities. This can positively affect subsistence use by providing more access and dispersing hunting and fishing pressures, but also has the potential for increasing competition in previously hard-to-reach areas, and may lead to over-harvest in combination with sport hunting and fishing. The several means of transportation available to Southeast Alaska residents (floatplanes, Marine Highway System, automobiles, boats) allow them to be highly mobile in getting to subsistence resources.

Subsistence use tends to occur where access to the resources costs less in energy than the resources gathered. The motorboat, and the development of road systems associated with logging in Southeast Alaska, have had perhaps the greatest influence on subsistence gathering activity. Today, all communities may be accessed by motorized boats and many are connected to interior lands by road systems. As new roads are developed, subsistence use moves from areas with higher access costs to areas with easily achieved access. Subsistence use is also concentrated in close proximity to individual communities and along the beaches. Each community throughout Southeast Alaska has distinct home ranges with concentrated use occurring in these home ranges. While the majority of use occurs within about a 15-mile radius of rural communities, nearly all of the forested lands of the Tongass are used to some degree for at least subsistence deer hunting.

Competition

The Tongass is a land of abundant resources, although all the resources are not evenly distributed across the Forest. Where subsistence resources are confined to island groups or river systems, or where access is costly or nonexistent, use of the resources is typically low. Where resources are abundant near a community, but access from other areas is costly, the resources tend to be used primarily by that community. Where resources are abundant and access is available to local as well as other rural and non-rural residents, competition for the resources is likely to exist. It is this latter case where subsistence restrictions are most likely to occur first if habitats are affected to the extent that huntable wildlife populations are reduced.

Increased competition can result when access to an area is improved, such as when road systems are established connecting local communities, or when new roads connect to communities serviced by the Alaska Marine Highway System or commercial air services. As an example, Chichagof Island, Prince of Wales Island, and the Yakutat Forelands were at one time isolated portions of the Tongass with limited use. Today, roads constructed for timber harvesting have made vast areas in each location readily available from local communities, several of which are serviced by ferries and/or commuter planes, and one (Yakutat) by commercial airline. Improved access may have the potential for increasing competition in areas traditionally used by particular Native Alaskan communities.

Competition for subsistence resources is likely to increase as long as Southeast Alaska's rural population grows and additional access is created. The Southeast Alaska Federal Subsistence Regional Advisory Council has noted this increased use of the resources, and recommended decreases in harvest of deer, moose, and other wildlife species for non-rural residents.

Environmental Consequences

The analysis of the likely effects of alternatives on subsistence resources and uses is in two parts. Effects on subsistence resources and uses important to each rural community are discussed individually by community in the Communities section. Here, the Forest-wide evaluation is presented, based on general considerations in the three categories of effects previously identified: abundance and distribution, access, and competition. This general analysis relies on the community discussions, and also on the Forest-wide effects analyses from the related resource sections (primarily Fish and Wildlife) where abundance and distribution are an issue.

As discussed more fully in the 1991 SDEIS, Section 810 of ANILCA requires a Federal agency, having jurisdiction over lands in Alaska, to evaluate the potential effects of proposed land-use activities on subsistence uses and needs, followed by specific notice and determination procedures should there be a significant possibility of a significant restriction of subsistence uses. The Alaska Land Use Council's definition of "significantly restrict subsistence use" is one guideline used in the evaluation: "A proposed action shall be considered to significantly restrict subsistence uses, if after any modification warranted by consideration of alternatives, conditions, or stipulations, it can be expected to result in a substantial reduction in the opportunity to continue subsistence uses of renewable resources." Considerations of abundance and distribution, access, and competition (by non-rural residents) are mentioned.

The U.S. District Court Decision of Record in Kunaknana v. Watt provided additional clarification. In part it states: "restrictions for subsistence uses would be significant if there were large reductions in abundance or major redistribution of these resources, substantial interference with harvestable access to active subsistence-use sites or major increases in non-rural resident hunting.

Direct and Indirect Effects

Abundance and Distribution

Based on the 1987 survey information presented above, 61 percent of subsistence resources (by weight) are fish or marine invertebrates, 21 percent are deer, 4 percent other land mammals, and another 3 percent marine mammals. The primary subsistence resource experiencing potentially significant effects by alternative is Sitka black-tailed deer. Some effects to fish habitat may also result from land management activities, but the magnitude of the effects cannot be calculated. Risk to fish habitat increases with increased timber harvest, increased roading, and narrower riparian areas along streams. A panel evaluation of alternatives (see Fish section) resulted in the following order of increasing risk: Alternatives 1, 5, 4, 3, 6, 8, 2, 9 and 7.

Due to their association with old-growth forest habitat, which is the main terrestrial habitat type affected by the alternatives, deer become the "indicator" for potential subsistence resource consequences concerning the abundance and distribution of the resources. The community-based subsistence analysis (Communities section) focuses largely on deer, which is by far the largest terrestrial component of subsistence food resources, and this in turn is based on the Sitka black-tailed deer effects analysis in the Wildlife section. (This is a change from the 1991 SDEIS, which evaluated several other mammal species. That analysis was based on habitat capability models no longer being used. These species are discussed under Wildlife).

In the subsistence analysis in the 1991 SDEIS it was determined that at that time all of the Forest Plan alternatives, if implemented, could result in a significant restriction on the abundance and/or distribution of subsistence uses of Sitka black-tailed deer, brown bear, and marten sometime during the next 50 years. This conclusion was based on an analysis of the current status of huntable wildlife resources, and identified portions of the Tongass where such restrictions may already be occurring (in other words, were the result of existing conditions) (SDEIS, 1991, pp. 3-762 and 3-763). The unpublished 1992 draft FEIS reached the same conclusion for deer and brown bear. Such restrictions were most likely for communities with subsistence use areas in the northern portion of the Tongass (Chichagof and Baranof Islands, primarily).

As discussed in the Wildlife section of this chapter, hunting demand and huntable populations of wildlife have only been reexamined for Sitka black-tailed deer. Using a revised habitat capability model, the new deer analysis reaches similar conclusions to that of the 1991 SDEIS, based on specific areas where recent deer harvests are high relative to deer habitat cabability. (This analysis is summarized at the end of the affected environment portion of the Wildlife section; see also Iverson 1996). This analysis identified 10 areas, all on Chichagof or Baranof Islands, or on smaller islands near Juneau, where current deer harvests exceed 20 percent of the estimated habitat capability; and another 19 areas exceeding 10 percent of capability (including 11 on Chichagof or Baranof Islands, and five on Prince of Wales Island). Areas exceeding 20 percent are those where deer harvest may be restricted, either directly through restrictions in seasons and bag limits, or indirectly through reduced hunter efficiency and increased difficulty in obtaining deer relative to historical rates. Areas between 10 to 20 percent may experience reduced hunter efficiency and moderate difficulty in obtaining deer. This analysis may underestimate negative effects because deer populations are normally below carrying capacity. Adverse effects to deer hunters may be further amplified with either reductions in deer habitat capability or increases in deer demand/harvest or both.

The new deer analysis, based only on current (already existing) conditions, is much in line with the previous (1991 and 1992) analyses (which also used the 10 and 20 percent harvest cutoffs and the same land units). It indicates that deer habitat capabilities in several portions of the Tongass may not be adequate to sustain the current levels of deer harvests, and that implementation of any alternative could therefore be accompanied by a significant possibility of a significant restriction on the abundance and/or distribution of subsistence uses of deer. (However, sport hunting restrictions would occur first, followed by selective subsistence reductions, based on ANILCA section 804.) This possibility, at least in the short-term, is largely due to the continuation of reduced habitat capabilities resulting from past habitat alterations, which is why it applies to all alternatives. The possibility is less, however, in several alternatives which apply a Forest-wide standard and guideline to exclude or minimize future timber harvesting in the areas identified above: these are Alternatives 1, 3, 4, 5 and 6.

Access

The discussion of effects on access to subsistence resources discussed in the 1991 SDEIS remains unchanged. None of the alternatives limit the use of public lands for the purposes of subsistence gathering activities. Historical access, by foot, boat, and floatplane, is available in all the alternatives for present and proposed foreseeable future activities. All communities having new road access to previously underutilized subsistence areas have capitalized on the opportunity to expand their range provided by the road systems. As a result of new road construction, new use patterns are likely to develop around some communities. Such changes are not likely to lead to a significant possibility of a significant restriction of subsistence access to the resources.

Competition

The discussion of effects on competition for subsistence resources discussed in the 1991 SDEIS remains essentially unchanged. Competition for subsistence resources is a result of factors such as fish and game regulations, mobility, the natural distribution of game species across the Tongass, decreases in resource populations as a result of habitat reductions, decreases in resource populations as a result of over-harvest, and access provided to rural communities in the form of roads, ferries, and commercial air carriers. The majority of the population (Juneau and Ketchikan residents) of Southeast Alaska is non-rural. Competition for the more abundant wildlife and fisheries resources near rural communities results from the combination of these factors.

For analyzing competition, the following assumptions are made:

1. New road construction adjacent to communities with ferry access will result in increased competition from outside communities.

2. New road construction adjacent to existing road systems where interties between communities exists will result in increased competition from surrounding communities associated with the inter-connected roads.

3. Habitat reductions will result in increased competition if regulations allow sport use to remain constant, with the same number of users seeking fewer huntable resources.

4. The demand for resources will remain constant or increase slightly as the habitat capability remains the same or declines over time.

Given these assumptions, implementation of all alternatives except Alternative 1 (which has essentially no timber harvesting or new road construction) could result in a significant possibility of a significant restriction of subsistence use by increasing competition for some subsistence resources by non-rural as well as rural residents. This is most likely to occur on Chichagof, Baranof and/or Prince of Wales Islands, where competition for deer and some other land mammals is already heavy, and habitat capability has been reduced as a result of timber harvest.

Cumulative Effects

The analysis of cumulative effects in the 1991 SDEIS is still generally applicable. Cumulative effects are discussed in four categories, as summarized below.

1. **Effects Resulting from Timber Harvesting of Private Lands**. Native Corporation lands adjacent to the Tongass National Forest support extensive timber harvest operations. Over the last 14 years (primarily on North Chichagof, Kupreanof, Admiralty and Prince of Wales Islands, and mainland areas), old-growth forest wildlife habitat capability in these lands, especially that for deer, has declined; and this decline is expected to continue for at least the next two decades. The resulting lower habitat capabilities on these private lands are likely to increase hunting demands in adjacent National Forest areas, increasing competition and potentially leading to reduced hunter success, reduced or eliminated sport seasons, and in some places reduced or eliminated subsistence seasons.

2. **Effects from Past Activities**. Timber harvest has been more influential in changing the landscape than any other use of the resources of the Tongass. With timber harvest comes roading, log transfer facility development, crew camps ranging from a few years in duration to establishment of new towns, and reductions in old-growth forest habitat. Intensive timber harvesting since the 1950's has resulted in over 400,000 acres of old growth becoming second growth

3. **Effects of Present Activities**. Implementation of the current Forest Plan has resulted in an annual average timber harvest of about 340 million board feet (since 1980), with an annual reduction of about 9,450 acres of old-growth habitat. Approximately 100 miles of road has been constructed annually to access the timber harvested during this time period. One major mining operation, the Greens Creek Mine, came on line and was under full-scale production until about two years ago, with some localized effects. It may reopen in the near future. Other large mines are in the exploratory or permitting phases of development.

4. **Effects of Reasonably Foreseeable Future Activities**. The conversion of old-growth forest habitat to second growth will occur at varying rates under the alternatives. The principal subsistence resource effect will be on Sitka black-tailed deer habitat, as previously discussed. If timber harvesting were to continue at roughly the present rate, over the next ten years another 94,000 acres of old-growth habitat would change to second-growth, and another l,000 miles of road would be built. The comparison of alternatives at the end of Chapter 2 (and the Timber and Transportation sections) display what is actually predicted for each alternative. With timber harvest activities will come new access, probably new camps, and potential increased use of subsistence resources by rural and non-rural residents.

Timber harvest of Native Corporation lands is anticipated to continue at a relatively low but constant level over the next decade. Land selections could result in some previously unharvested areas being logged. Actual mineral development is difficult to predict; if it occurs, any effects to subsistence resources would be highly localized.

ANILCA Determination

An ANILCA Section 810 evaluation and determination is not required for approval of a Revised Forest Plan, a programmatic level decision that does not commit to any land use with the potential to significantly restrict subsistence uses. A Forest-wide evaluation and determination is included for the Forest Plan Revision so that it may be tiered to in project level planning and decision making in compliance with ANILCA Section 810.

Consistent with Section 810 of ANILCA, the alternatives considered in this Revised Supplement have been evaluated for potential effects on subsistence uses and needs, as described above. Based on this evaluation it has been determined that, in combination with other past, present and reasonably foreseeable future actions, one or more of the Revised Supplement alternatives, if implemented through project-level decisions and actions, may result in a significant restriction of subsistence uses of deer, and possibly other land mammals, due to potential effects on abundance and distribution, and on competition.

As a result of this finding, the USDA Forest Service will notify the appropriate State agencies, local communities, the Southeast Alaska Federal Subsistence Regional Advisory Council, and State Fish and Game Advisory Committees, and hold hearings in affected communities throughout Southeast Alaska. Notification and hearings will be held either in coordination with or separate from community meetings seeking public comment on the Revised Supplement. These meetings will be scheduled after the Revised Supplement is released for public review.

Section 810 (a)(3) of ANILCA requires that when a significant restriction may result, three determinations must be made. Preliminary determinations follow:

1. **Necessity, Consistent with Sound Management of Public Lands**. The alternatives proposed in this Revised Supplemental Draft Environmental Impact Statement for revising the Tongass Land Management Plan have been examined to determine whether they are necessary, consistent with sound management of public lands. In this regard, the National Forest Management Act of 1976, the Alaska National Interest Lands Conservation Act, the Tongass Timber Reform Act, the Alaska Regional Guide, the Tongass Land Management Plan, as amended, the Alaska State Forest Resources and Practices Act, and the Alaska Coastal Zone Management Program have been considered.

   National Forest land management plans are required by NFMA, and must provide for the multiple-use and sustained yield of renewable forest resources in accordance with the Multiple-Use Sustained Yield Act of 1960. Multiple-use is defined as "the management of all the various renewable surface resources of the National Forest System so that they are utilized in the combination that will best meet the needs of the American people" (36 CFR 219.3). The alternatives presented herein represent different ways of managing Tongass National Forest resources in combinations that are intended to meet the needs of the American people. Each provides a different mix of resource uses and opportunities, and each has some potential to affect subsistence uses. Given the theme and emphasis of each alternative, their proposed actions are necessary, consistent with the sound management of public lands.

2. **Amount of Public Land Necessary to Accomplish the Proposed Action**. The amount of land necessary to implement the action alternatives is, considering sound multiple-use management of public lands, the minimum necessary. The entire forested portion of the Tongass (except the Yakutat area) is used by at least one rural community for subsistence purposes for, at a minimum, deer hunting. It is not possible to avoid all of these areas in implementing resource use activities such as timber harvesting and road constuction under any Forest Plan alternative (Alternative 1 does not continue such activities), and attempting to reduce effects in some areas can mean increasing the use of others. The proposed Forest-wide standards and guidelines, and LUD prescriptions, provide for special management or limit activities in many of the areas most important for subsistence uses, such as beaches and estuaries, areas adjacent to roads, and areas with high fish and wildlife habitat values.

3. **Reasonable Steps to Minimize Adverse Impacts To Subsistence Uses and Resources**. The Forest-wide standards and guidelines and LUD prescriptions will be implemented as part of any alternative action. Subsistence use is addressed specifically in a Forest-wide standard and guideline, and subsistence resources are covered by the Forest-wide standards and guidelines for wildlife, fish, riparian areas, and biological diversity, among others. Fish and wildlife habitat productivity will be maintained at the highest level possible, consistent with the overall multiple-use goals of each alternative. Most alternatives incorporate specific strategies for maintaining fish and wildlife habitats to ensure, at a minimum, the viability of all species.

A final determination will be made in the Record of Decision for the Final Environmental Impact Statement for the Tongass Land Management Plan Revision. The final determination will revisit the above criteria and make final determinations on each of the categories considering further information obtained from hearings, public comments, new information, and other sources incorporated in preparation of the FEIS. A summary of the evaluation, findings and determinations will be contained in the Record of Decision.

Threatened, Endangered and Sensitive Species

Affected Environment

Threatened and Endangered Species

Federally listed Threatened and Endangered species are those plant and animal species formally listed by the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS), under authority of the Endangered Species Act (ESA) of 1973, as amended. An endangered species is defined as one which is in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as one which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

The 1991 SDEIS presented a complete discussion of the threatened, endangered and sensive species of the Tongass. The arctic peregrine falcon was delisted as a Threatened species by the FWS and is the only change in classification of the Endangered and Threatened species found within the Tongass National since the 1991 SDEIS. Informal consultations with the FWS and NMFS subsequent to the SDEIS, part of the Biological Assessment process for all Endangered and Threatened species that may be affected by the forest plan revision, led to revising portions of the Forest-wide standards and guidelines pertaining to some of these species. Those changes have been incorporated into the Proposed Revised Forest Plan, Chapter 4. Recovery plans have been prepared for the humpback whale, northern right whale, Steller's sea lion, and the American peregrine falcon.

Candidate Species

The 1991 SDEIS discussed "Candidate species" - three categories of species being considered for listing as Threatened or Endangered under the ESA. Candidate species were not provided any legal protection under the ESA. The FWS has modified their candidate species program since the 1991 SDEIS (Rogers 1996). Candidate species are those species for which the FWS has on file sufficient information on biological vulnerability and threats to support issuance of a proposed rule to list the species under the ESA (formerly identified as Category 1 Species). There were and still are no candidate species on the Tongass National Forest.

FWS Category 2 species are no longer recognizied, but in the 1991 SDEIS were those taxa for which listing as Threatened or Endangered may be appropriate, but for which conclusive data on biological vulnerability and threat were not currently available to support a proposed listing. Four plant and six wildlife Category 2 species were discussed in the 1991 SDEIS, and four more Category 2 wildlife species had been designated since that time. The FWS no longer uses the term Category 2 species but has redesignated these taxa as "species of concern." Of the four species added since the 1991 SDEIS (the others are discussed therein), the northern goshawk and Alexander Archipelago wolf were both the subject of ESA listing proposals that were reviewed and formally accepted by the Fish and Wildlife Service. The FWS concluded that listing was not warranted for either species, but remains concerned for their long-term viability. These two species are specifically included in the viability strategies, as discussed under Wildlife. The other two, harlequin duck and spotted frog, are discussed briefly here under environmental consequences.

Sensitive Species

Sensitive species are those plant and animal species identified by the Regional Forester for which population viability is a concern on National Forests within the Region. A viability concern is evidenced by either a significant current or predicted downward trend in population numbers or density, or a significan current or predicted downward trend in habitat capability that would reduce a species' existing distribution. It is USDA Forest Service policy to identify and manage Sensitive Species and their habitats to prevent the species from becoming threatened or endangered because of Forest Service management actions. The goal of the Forest Service Sensitive Species Program (FSM 2670) is to ensure that species numbers and population distribution are adequate so that no Federal listing will be required and no Forest extirpation will occur. Forest Service management of sensitive species is an example of the species or "fine filter" approach to the maintenance of biodiversity (see Biodiversity). In addition, the Forest Service has entered into an interagency memorandum of understanding with the FWS and other federal agencies at the national level, and with the FWS and Alaska Department of Fish and Game at the regional level, to cooperate in the conservation of species tending toward federal listing so that listing is unnecessary.

The Regional Sensitive Species List was first established in 1990, and a technical revision was completed in 1994 when 22 plants and Queen Charlotte goshawk were added. There are 22 plants and 7 vertebrates currently designated as Sensitive Species within the Tongass National Forest (Table 3-47). The osprey, Peale's peregrine falcon, trumpeter swan, northern pike, Fish Creek chum salmon, King Salmon River and Wheeler Creek populations of king salmon, and Queen Charlotte (or northern) goshawk are discussed in the 1991 SDEIS (the northern goshawk was not a sensitive species at that time, but was included under Wildlife).

The Regional Sensitive Species List has not been completely revised since its original development and a revision of the list is in progress. Two new criteria were used to judge the relative rarity and population status for potential Sensitive Species consideration and recommended for Sensitive Species designation. These included:

1. **FWS Species of Concern**: Species that are important indicators of those taxa the FWS is considering for federal listing as Threatened or Endangered (formerly Category 2 Candidate Species).

2. **Natural Heritage Program Rare Species Global Rankings**. The Nature Conservancy (TNC) Natural Heritage Programs nationally and internationally have established a Global Ranking System to systematically evaluate and identify levels of ecological concern for taxa (species, subspecies, or described variety). Data describing abundance, range population trends, threats, and protection status are considered. The following rating system is used:
   - G1 = Taxa is critically imperiled globally
   - G2 = Taxa is imperiled globally
   - G3 = Taxa is either very rare and local throughout its range or found locally in a restricted range
   - G4 = Taxa is apparently secure globally
   - G5 = Taxa is demonstrably secure globally

   Modifiers that may accompany G ratings:
   - Q = The current taxonomical status is uncertain
   - T = Rank of a described variety or subspecies of the species
   - G = Global rank of species uncertain but estimated between the range

   When the rank of a taxa is uncertain, the rank is estimated to occur between a range, e.g. G2G3 or T3T4

There is not always a direct one-to-one relationship between Global Rankings and Threatened and Endangered species listings. Global rankings take into account natural rarity with low threats and rankings transcend jurisdictional boundaries and may better reflect rangewide ecological status and imperilment. Most listed species have high ranks under the TNC ranking system, but not all high-ranked species are listed. For example, the ranking for the Alexander Archipelago wolf is G4T2T3Q. This means that the wolf in general (*Canis genus*) is apparently secure globally. However, the *Ligoni* subspecies (T) that occurs in Southeast Alaska is rated T2T3 meaning its conservation status is between imperiled globally (T2) or either very rare throughout its range or found locally within a restricted range (T3). The modifer "Q" indicates that the taxanomic subspecies *Ligoni* is in question and in need of further examination.

Table 3-47 identifies those species that are FWS species of concern, TNC "Species of Ecological Concern" (West 1993) and that are currently Forest Service Sensitive Species. Those species that are being proposed for Forest Service Sensitive Species designation are shown in the last column and generally meet the following criteria:

FWS Candidate Category 1 species (none occur in Alaska Region);
TNC G1 or G2;
FWS Special Concern species *and* a TNC G3;
Other species with known or potential threat to the species or its habitat.

Table 3-47
Conservation status of wildlife and fish species and subspecies in the Alaska Region (ss = Sensitive Species)

Common Name (*Scientic Name*)	FWS Special Concern	ANHP Rank	Forest Service Status Current	Forest Service Status Proposed
Mammals				
Alexander Archipelago wolf (*Canis lupus ligoni*)	Y	G4T2T3Q		SS
Glacier Bay water shrew (*Sorex alaskanu)*	Y	G5THQ		
Montague Island tundra vole (*Microtus oeconomus elymocetes*	Y	G5T2	SS	SS
North American lynx (*Felis lynx canadensis)*	Y	G4T4		
Keen's myotis *(Myotis keenii)*		G2G3		SS
Prince of Wales Island flying squirrel *(Glaucomys sabrinus griseifrons*		G5T2?Q		SS
Suemez Island ermine (*Mustela erminea seclusa)*		G5T2?Q		SS
Wrangell Island red-backed vole (*Clethrionomys gapperi wrangeli*)		G5T2T3		
Montague Island hoary marmot (*Marmota caligata sheldoni*)		G5T3?		
Pacific harbor seal (*Phoca vitulina richardsi)*		G5T3?		
Birds				
Northwestern great blue heron (*Ardea herodias fannini)*		G5T2?		
Trumpeter swan (*Cygnus buccinator*)		G4	SS	
Dusky Canada goose (*Branta canadensis occidentalis)*		G5T2	SS	
Harlequin duck (*Histrionicus histrionicus*)	Y	G4		
Osprey (*Pandion haliaetus carolinensis)*		G4G5T2T3	SS	SS
Queen Charlotte goshawk (*Accipiter gentilis laingi*)	Y	G4T1T2	SS	SS
Black merlin (*Falco columbarius suckleyi*)		G4T2?		
Peale's peregrine falcon (*Falco peregrinus peali)*		G3T3	SS	
Franklin's spruce grouse (*Dendragapus canadensis franklinii*)		G5T3?	SS	SS
Marbled murrelet (*Brachyramphus marmoratus*)	Y	G3G4		SS
Kittlitz's murrelet (*Brachyramphus brevirostris*)	Y	G4		
Olive-sided flycatcher (*Contopus borealis*)	Y	G5		
Pacific Steller's jay (*Cyanocitta stelleri carlotte*)		G5T2?		

Amphibians				
Spotted frog (*Rana pretiosa*)	Y	G3		SS
Fish				
Bull trout (*Salvelinus confluentus*)	Y	NA		
Northern pike (Pike Lakes) (*Esox lucius*)		G5T2Q	SS	SS
Chum salmon (Fish Creek) (*Oncorhynchus keta*)		G5T2?Q	SS	SS
King salmon (Wheeler Creek) (*Oncorhynchus tshawytscha*)		G5T2?Q	SS	SS
King salmon (King Salmon River) (Oncorhynchus tshawytscha)		G5T2?Q	SS	SS
Vascular Plants				
Crucifer, no common name (*Aphragmus eschscholtzianus*)		G3	SS	
Norberg arnica (*Arnica lessingii ssp. norbergii*)		G5T2Q	SS	SS
Goose-grass sedge (*Carex lenticularis var. dolia*)	Y	G5T2	SS	SS
Ascending moonwort fern (*Botrychium ascendens*)		G?		SS
Super round wedge moonwort fern (*Botrychium*, unnamed)		G1S1		SS
Edible thistle (*Cirsium edule*)		G3	SS	
Pretty shooting star (*Dodecatheon pulchellum ssp. alaskanum*)		G5T2Q	SS	SS
Northern rockcress (*Draba borealis var. maxima*)		G5T2Q	SS	SS
Kamchatka rockcress (*Draba kamtschatica*)		G1Q	SS	SS
Tundra whitlow-grass (*Draba kananaskis*)		G1Q	SS	SS
Davy mannagrass (*Glyceria leptostachya*)		G3	SS	
Wright filmy fern (*Hymenophyllum wrightii*)		G3G4	SS	
Truncate quillwort (*Isoetes truncata*)		G1G2	SS	SS
Calder lovage (*Ligusticum calderi*)		G3	SS	
Pale poppy (*Papaver alboroseum*)		G3	SS	
Choris bog orchid (*Platanthera chorisiana*)		G2G3	SS	SS
Bog orchid (*Platanthera gracilis*)		G2Q	SS	SS
Loose-flowered bluegrass (*Poa laxiflora*)		G3	SS	SS
Smooth alkali grass (*Puccinellia glabra*)		G3Q	SS	
Kamchatka alkali grass (*Puccinellia kamtschatica*)		G3Q	SS	
Straight-beak buttercup (*Ranunculus orthorhynchus var. alaschensis*)		G5T2Q	SS	SS
Unalaska mist-maid (*Romanzoffia unalaschcensis*)		G2G3	SS	SS
Willow, no common name (*Salix reticulata ssp. glabellicarpa*)		G5T2		SS
Queen Charlotte butterweed (*Senecio moresbiensis*)		G3	SS	
Circumpolar starwort (*Stellaria ruscifolia ssp. aleutica*)		G4T2T3	SS	SS

Environmental Consequences

The potential environmental consequences to the Endangered and Threatened species within the Tongass were fully discussed in the 1991 SDEIS. The FWS and NMFS concurred with the Forest Service "no effect" determinations for all these species (with concurrence completed in 1992), based on following the proposed Forest-wide standards and guidelines. These standards and guidelines have been updated based on FWS and NMFS recommendations, and are a part of the Proposed Revised Forest Plan. The environmental consequences are unchanged since the 1991 SDEIS, and this discussion will not be repeated.

Environmental consequences to the (former) Category 2 species and Sensitive Species were also discussed in detail, also based largely on the Forest-wide standards and guidelines proposed for most individual species. These analyses are still considered accurate; the standards and guidelines have been retained, with some improvements. The marbled murrelet (formerly a Category 2 candidate species) is also discussed in the Wildlife section in relation to the viability strategies, as are the northern goshawk and Alexander Archipelago wolf, neither of which were discussed in this section (but in the Wildlife section) in the 1991 SDEIS. Two FWS species of concern species identified since 1991 are discussed briefly here.

Harlequin Duck. Harlequin duck nesting habitat occurs primarily along inland rivers and streams, particularly higher gradient streams. Riparian habitats along all rivers and streams of the Tongass will be managed under Riparian Forestwide Standards and Guidelines. The potential effect on harlequin duck nesting habitat may vary by alternative depending upon the extent of the riparian habitat protection. Alternatives protecting wider riparian habitats with Riparian Options 1 or 2 (Alternatives 1,3,4,5,6 and 8) will likely fully protect harlequin duck nesting habitat based upon our current, but limited, understanding of nesting habitat relationships. Alternatives with narrower riparian habitat protection (Alternatives 2, 7 and 9) may potentially affect some nesting habitat in land allocations permitting disturbance such as road building or timber harvest. However, much of the known occupied habitat of this species is within Wilderness, and no significant adverse effects are anticipated.

Spotted Frog. The spotted frog is aquatic, found in or along the grassy margins of permanent water sources. Riparian habitats along all lakes, rivers and streams of the Tongass will be managed under Riparian standards and guidelines. Potential effects on spotted frog habitat will be minimized with more protective Riparian habitat management standards such as Options 1 or 2. Less restrictive riparian habitat management may potentially affect limited spotted frog habitat. However, most spotted frog populations have been identified in either Wilderness (Stikine River population) or primitive recreation land use designations (Taku and Unuk River systems) and no significant adverse effects are anticipated within these areas.

Additional mitigation is provided by the Threatened, Endangered and Sensitive Species standards and guidelines (Proposed Revised Forest Plan, Chapter 4).

Timber

Affected Environment

The forests of Southeast Alaska have long provided a source of timber to the regional economy and Pacific Rim markets. From 1980 through the present, the Tongass National Forest has accounted for about 50 percent of the total Southeast Alaska timber harvest. Timber from the Tongass is harvested for pulp, sawn wood products such as lumber and cants, wood chip exports, and export logs (usually cedar). Timber is one of several valuable resources in Southeast Alaska and many people depend on it for their livelihood. Wood has become the basis for a major industry that provided about 3,849 jobs (2,225 from direct employment; 1,624 from indirect employment) during fiscal year 1994 (Tongass National Forest Timber and Wood Products Trade Data, 1994). Forest products from Southeast Alaska are marketed throughout the world.

The 1991 SDEIS contained considerable background information on the timber resource: species composition and stand characteristics (age and/or volume classes), historic timber supply, silvicultural and logging methods, the timber land base (availability and suitability), potential yield, the timber sale program, timber economics, and market demand. Most of that information is still valid and will only be briefly summarized here, and updated as needed. Other topics are discussed in more detail to reflect new information.

The forests of Southeast Alaska are primarily of the western hemlock-Sitka spruce forest type. This type is a segment of the temperate rain forest that occupies a coastal strip 2,000 miles long from southern Oregon to southcentral Alaska. The most extensive forests are in Southeast Alaska. Within the Tongass, western hemlock and Sitka spruce stands cover 98 percent of the timberlands, with the remaining 2 percent supporting western redcedar, Alaska-cedar, and cottonwood. Western hemlock is used for pilings, poles, railway ties, and construction lumber, and is an important fiber source for pulp. Sitka spruce is used for speciality products such as piano sounding boards and guitar faces, oars, planking, masts, and spars for custom-made or traditional boats, and ladders; poorer quality Sitka spruce is also used for pulp. The cedar species have been used by Alaska Natives for centuries, for canoes and paddles, housing (along with Sitka spruce), and totem poles. Today redcedar is primarily used as a roofing material; Alaska-cedar is suitable for many uses, including boats, utility poles, heavy flooring, framing, and marine decking and piling.

Clearcutting, with reliance on natural seeding from adjacent timber, has been the most commonly used silvicultural system in the Sitka spruce-western hemlock forest types. Clearcutting is used where timber production is the primary use and where it is the optimum method. The clearcutting method is favored for several reasons. Clearcutting increases exposure to the sun, which raises soil temperature, speeds up organic decomposition, and thus improves soil productivity. The regeneration of Sitka spruce is favored in open sites with disturbed soils. Clearcutting also aids in controlling dwarf mistletoe by eliminating infected overstory trees, and minimizes windthrow and logging damage. Logging costs are lower than with other systems. The clearcut method has proven very successful in the regeneration (regrowth) of healthy forested stands. (A fuller discussion is included in Appendix G of the 1991 SDEIS.)

However, the practice of clearcutting has been, and continues to be, a controversial issue. The main concerns center around the esthetics of clearcuts, and the loss of old-growth forest stands. The Alaska Region has begun an "Alternatives to Clearcutting" study, and several of the Revised Supplement alternatives prescribe silvicultural methods other than standard clearcut harvesting. These methods involve both the harvest of trees singly or in small groups (typically called uneven-aged management), leaving residual trees in clearcuts, and extending the "rotation age" of harvesting - the time period at which a previously-harvested area or stand can be harvested again. These various options are now briefly described (see also the Forest-wide standards and guidelines for timber in Chapter 4 of the Proposed Revised Forest Plan).

Uneven-aged Systems. This is typically the harvesting of single trees from within a stand, or of small groups of trees (usually less than two acres). This method maintains a multi-aged, multi-layered stand structure by removing some trees in all age groups. Very little is known about the ultimate success of uneven-aged methods in Southeast Alaska.

Two-aged Systems. In this system, approximately 10-20 percent of a stand is left as residual (or reserve) trees, both singly and in patches, and the rest of the stand is harvested. The reserve trees and patches remain unharvested, and provide structural diversity and an older aggregation of trees within the otherwise young-growth stand.

Extended rotations. In Southeast Alaska, old-growth forest conditions are normally not reached until a stand is 160-years old or older. Extending the time period before a second-growth stand is scheduled for a second harvest gives the stand more time to acquire at least some characteristics of old-growth forests. Extended rotations also mean either fewer entries into a given area within a given time period, or smaller amounts of harvest when entries are made, but can increase the need for roads if equivalent volumes are to be harvested. Currently second-growth is projected to be harvested on an average 100-year rotation cycle.

After harvest, young second-growth stands can be treated through thinning and other methods to promote growth and tree quality. In recent years, such timber stand "improvements" have typically consisted of precommercial thinning and have averaged 5,600 acres per year. Commercial thinning and prunning are additional methods available under some of the alternatives. Together these methods may significantly speed up the growth of high-quality, high-volume stands of trees for future harvesting, or may be used to promote conditions that mimic old-growth stand characteristics. On the other hand, they can add substantially to the cost of the timber program.

Most logs are yarded downhill using cable logging systems such as highlead and skyline. Access is usually from valley bottoms because road building on steep slopes is difficult and costly. Most logging occurs inland with logs transported via road systems to log transfer facilities at tidewater (see Transportation). Harvest by tractor has been limited; it is not practical on most of the soils and topography found in the Tongass. Harvest by helicopter has been limited in the past but is increasing: it is typically the costliest method, but also causes the least resource damage.

Yarding methods can be divided into three "operability" classes, which relate to the methods necessary to harvest and transport trees under various conditions. Normal operability includes the standard cable logging systems used in areas where access is relatively easy. These areas have the lowest logging costs. Difficult operability includes longspan cable systems and helicopter logging, occuring where ground access is difficult or not possible. Difficult operability involves higher costs. The third class, isolated operability, consists of isolated stands a mile or more from a helicopter landing site. These tend to be uneconomic under even high timber markets.

The concern over operability class has increased in recent years, as information is showing a disproportionate harvest (in terms of the total suitable timber base) of the normal operability lands. Normal operability areas make up about 70 percent of the tentatively suitable land base, yet from 1980 to 1991 they represented about 94 percent of the harvest. Difficult operability areas account for 22 percent of suitable lands, but less than 6 percent of the harvest of these same years. The remaining 8 percent of suitable lands, classed as isolated, accounted for only 0.5 percent of the harvest. As harvest continues to occur disproportionate to the make-up of the suitable timber base, sustained yields will depend on harvesting the difficult and isolated areas in the future, and under present systems and technology these areas will be more costly to harvest.

The primary sources of timber within Southeast Alaska are the Tongass National Forest, private corporations (principally Alaska Native Corporations formed through the Alaska Native Claims Settlement Act), and the State of Alaska. The 1991 SDEIS has information on harvests from all ownerships, on harvests from the Tongass since early in this century, and the amount of timber offered, sold (or "released" in the case of the long-term contracts), and harvested annually, under both the short-term (or "independent") and long-term timber sale programs, since 1980. To update some of this information, the amount of timber (sawlog plus utility volume) offered, sold, and harvested under both programs in recent years is shown in Table 3-48.

Table 3-48
Tongass timber sale program, 1990 to 1995 (timber volumes in million board feet, sawlog plus utility)

Sale Program	1990	1991	1992	1993	1994	1995
Independent Sales						
Offered	54	79	40	61	100	110
Sold	26	52	81	45	52	102
Harvested	173	90	72	55	47	59
Long-term Contracts						
Offered	331	318	449	257	207	217
Released	287	354	357	303	217	159
Harvested	298	273	298	270	229	162
Total Program						
Offered	385	397	489	318	307	327
Sold/Released	313	405	429	348	269	261
Harvested	471	363	370	325	276	221

The Tongass National Forest's timber sale program is composed of the long-term sale (50-year contract) program, the short-term or independent sales (typically less than 7 years) program, and the firewood/personal use program. Two-thirds to three-fourths of the timber volume made available each year on the Tongass National Forest has gone to long-term sales. Prior to the early 1950's, the average annual timber harvest on the Tongass was about 45 million board feet per year. Since establishment of the long-term contracts around 1952, timber harvest has averaged approximately 364 million board feet (sawlog plus utility) per year. Tongass timber is considered available to industry when it has been offered for sale in short-term sales or approved units have been released to the operators in the long-term sales.

A significant change in the long-term timber sale program has occurred since the 1991 SDEIS. One of the two long-term contract holders, Alaska Pulp Corporation, closed their Sitka pulp mill in 1993, and that contract was subsequently terminated by the Forest Service in 1994. Thus the Tongass timber program no longer has a requirement to supply Alaska Pulp Corporation with timber, and the long-term sales program now consists of only the Ketchikan Pulp Company. The Ketchikan Pulp Company contract will be in effect until 2004.

The market demand for Tongass National Forest timber is derived from a complex set of factors including Southeast Alaska's timber industry (mill) capacity, international timber markets, and available and projected supplies locally, nationally, and world-wide (the 1991 SDEIS has a fuller discussion of these and other factors). Several economic consultants have projected the demand for Tongass timber in recent years, with varying results. The Alaska Region continues to use the projections of the Pacific Northwest Research Station (PNW) of the Forest Service as the most reliable and defensible estimates (Haynes and Brooks, 1994). The PNW projections take into account international markets for wood products, recent developments affecting demand in the Pacific Northwest and Canada, and local industry conditions and mill capacities.

The PNW projections are revised periodically. This year's revised estimates include consideration of recent changes in world pulp markets and closure of the Sitka pulp mill. The closure of this mill significantly affects the pulp wood component of demand. Sawlog demand is not similarly affected, and the Wrangell mill closure (the Wrangell mill is currently owned by Alaska Pulp Corporation) is not considered to be permanent (the sawlog market can support its reopening or replacement).

In the estimation of the Pacific Northwest Research Station, over the next 15 years (1996-2010), total market demand for Tongass National Forest timber is projected to average 320 million board feet (MMBF) per year, increasing from 300 MMBF in 1996 to 338 MMBF in 2010. (The average can be broken down into 210 MMBF sawlog, 67 MMBF pulp log, and 43 MMBF export log. Pulp log includes low grade sawlogs and utility logs.) Of the two main components of this demand, sawlog and pulp wood, sawlog demand will increase by about 55 percent, but pulp wood demand will decrease by about 30 percent. This changes the historic mix of sawlogs and pulp logs harvested from the Tongass (roughly 55 percent sawlog at present), and raises the question of whether sawlogs (typically the higher volume trees) can be supplied at the projected level.

PNW projections also consider stumpage prices - defined as the average price of timber sold. Alaska stumpage prices are expected to increase (faster than the inflation rate) overall as a result of projected increases in sawlog prices in the Pacific Northwest. Alaska sawlog prices will increase in proportion to Pacific Northwest prices, and pulp prices will remain constant, at about the average value for the period 1975-94. Over the past 15 years, market pulp prices, adjusted for inflation, have been roughly constant (although subject to cycles).

The timber land base of the Tongass, the process for determining acres "suitable" for timber management, and the characteristics of the suitable timber, were all described in the 1991 SDEIS and can be summarized here. There are several ways to categorize the land base: into withdrawn areas (such as Wilderness) and available areas; into forest and non-forest lands; and, within the forested lands, into productive (capable of growing trees of commercial value) and non-productive. Of the approximately 17 million acres of the Tongass, about 7 million are non-forest lands. Of the remaining 10 million acres, about 4.2 million are withdrawn from timber production. Of the remaining (not withdrawn) 5.8 million acres, about 2.4 million are not capable of growing commercial timber (termed unproductive timber lands). Another 856,000 acres are either physically unsuited (for instance, irreversible resource damage could occur), or are lands about which there is inadequate information. In 1991 this left 2.54 million acres; since then, another 250,000 acres have become either unavailable or unsuitable due to land ownership adjustments, newly-discovered streams requiring Tongass Timber Reform Act protection, and a change in the slope break for determining high hazard soils (from 75 to 72 percent), leaving 2.29 million acres considered "tentatively" suitable for timber management - tentative, in that the land allocations under each alternative will determine what areas are actually suitable to be managed for timber production.

The biological potential yield of the Forest (the amount of timber that could be produced on all available forested lands) with no reductions for other resource considerations, technical problems, etc., is approximately 1.56 billion board feet annually (this is a slightly higher estimate than in the 1991 SDEIS). The potential yield on the tentatively suitable land base is 704 million board feet annually; this land base currently contains 51 billion board feet of standing sawlog volume. As of 1992, approximately 84 percent of the 2.3 million acres of tentatively suitable lands contained stands over 150 years in age.

The timber yield (i.e., volume per acre) estimates for second growth were recently evaluated, and were found to be consistent with published yield studies. It was also determined that these young-growth yield tables have minimal influence on the calculation of the ASQ; the controlling factor being the harvest of existing (old growth) stands. However, these young-growth projections cannot be used to project yields from the partial cutting of old-growth stands over time, since there is no experience or data with this type of harvest method. There have been several updates (additional growth and yield data) since the tables were first constructed; as a result, the yield tables have been revised for the Revised Supplement, and are included in the planning record.

Environmental Consequences

The analysis of the potential effects of the alternatives addresses the following questions:

- How much land will be allocated to timber production?
- What silvicultural systems and vegetative practices would be utilized?
- At what intensity would these lands be managed?
- What would be the allowable sale quality (ASQ) and long-term sustained yield?
- What are the factors that affect the attainment of the ASQ?
- What would be the quantity and quality of products (sawlogs vs pulplogs) produced?
- How would the timber supply compare to historic harvest levels?
- Would the timber supply meet our long-term contract obligations?
- How much timber would be available for the small business (SBA) program?
- Would there be a sufficient timber supply for a 10-year contract?
- How would the alternatives be implemented in the form of a timber sale action plan?
- How should proportionality be handled at the programmatic level?
- What would be the future conditon of the Forest in 160 years?

The effects on the existing timber industry infra-structure are discussed in the socio-economic section of this chapter.

Suitable Timber Lands

Tentatively suitable lands, as defined by NFMA regulations (36 CFR 219.14(a)) and Section 102 of the Tongass Timber Reform Act, include about 2,322,000 acres. This represents about 14 percent of the total Forest acres and is the same for all alternatives. Appendix A of the Proposed Revised Forest Plan is a detailed discussion of the tentatively suitable determination process.

The 1991 SDEIS had a tentatively suitable land base of 2.54 million acres. The changes since then, by Administrative Area, are displayed in Table 3-49.

Table 3-49
Changes in Tentatively Suitable Land Base (in millions of acres)

	1991 SDEIS	Revised Supplement
Chatham	.74	.71
Stikine	.69	.68
Ketchikan	1.11	.93
Total	**2.54**	**2.32**

The reasons for the reduction are:

Extreme Hazard Soils. On July 5, 1995, the Forest Service published an overview of the characteristics controlling hillside stability in Southeast Alaska. The paper concluded, based on the findings, that Mass Movement Index 3 and 4 (MMI 3 and MMI 4, respectively) should be adjusted for the TLMP Revision. MMI 3 should be from 51 to 72 percent slope and MMI 4 should be slopes greater than 72 percent. Previously, 75 percent slope had been used for the cutoff.

Better Resource Inventories. The Ketchikan Area had its timber suitability information updated by a private contractor. Changes from this update have been incorporated. (Suitable Timber Analysis, Operability Analysis, and Resource Data Enhancement for the Ketchikan Area, Tongass National Forest. draft report, December 22, 1995.)

Landownership Adjustments. Approximately 59,000 acres of National Forest land have been converted to private ownership since the 1991 SDEIS.

During the alternative development process, additional lands within the tentatively suitable timber base (2.3 million acres) were determined to be inappropriate for timber production (36 CFR 219.14) in accordance with each alternative's objectives, and were classified as unsuitable. This occurred if other land use objectives precluded timber management. The lands considered suitable for timber production therefore vary by alternative.

Table 3-50 displays the amount of tentatively suitable land, and the amount each alternative would designate as suitable for timber management. The amount of suitable land would vary from 0.4 percent of the Forest in Alternative 1 to 12 percent of the Forest in Alternative 7. Only Alternatives 7 and 9 have a suitable land base greater than 1.7 million acres. This significant difference results primarily from differences in assigning the old-growth Forest, Remote Recreation, and Semi-remote Recreation LUD's. In Alternative 1, 89 percent of the tentatively suitable acres are assigned to Remote or Semi-remote Recreation. Alternatives 3, 5, 6 and 8 have substantial timber-suitable acreages assigned to the Old-growth Habitat LUD.

Removing land from the suitable land base reduces both potential ASQ and long-term timber growth and yields. While the effect is not perfectly linear, the magnitude of the reduction is generally related to the proportion of lands removed. The timber production lost is irretrievable but is not irreversible. If future designation of these lands is changed to allow timber management, it would be possible to resume timber management activities.

Where land is dedicated to road construction or development of facilities, minerals or rock excavation, the loss of land for timber production is generally irretrievable and may be irreversible. Similarly, the occurrence of landslides or excessive erosion can significantly degrade soil productivity thus reducing potential forest growth and yield.

Table 3-50
Land Classification (thousands of acres) Tentatively Suitable and Suitable Lands

Classification	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
1. Non-Forest land (includes water)	6,960	6,960	6,960	6,960	6,960	6,960	6,960	6,960	6,960
2. Forest land	9,978	9,978	9,978	9,978	9,978	9,978	9,978	9,978	9,978
3. Forest land not capable of producing crops of industrial wood.	2,416	2,416	2,416	2,416	2,416	2,416	2,416	2,416	2,416
4. Forest land physically unsuitable:									
irreversible damage likely to occur	573	573	573	573	573	573	573	573	573
not restockable within 5 years	63	63	63	63	63	63	63	63	63
5. Forest land - inadequate information	431	431	431	431	431	431	431	431	431
6. Forest land withdrawn from timber production	4,174	4,174	4,174	4,174	4,174	4,174	4,174	4,174	4,174
7. Tentatively suitable forest land (item 2 minus items 3, 4, 5 and 6)	**2,321**	**2,321**	**2,321**	**2,321**	**2,321**	**2,321**	**2,321**	**2,321**	**2,321**
8. Forest land not appropriate for timber production									
Research Natural Areas	2	2	2	2	2	2	0	0	0
Remote Recreation	427	81	81	81	81	81	14	14	247
Old Growth	20	7	354	7	136	136	0	507	0
Semi-Remote Recreation	1,657	362	362	362	362	358	121	121	16
Scenic Viewsheds	0	65	52	66	62	62	0	0	28
Modified Landscapes	0	68	57	68	62	61	7	13	0
Beach Fringe and Scenic Viewshed [1]	6	121	129	127	118	118	103	245	69
Wild, Scenic or Recreation Rivers	82	30	30	30	30	30	0	0	0
Special Areas	24	29	29	29	29	32	1	1	0
LUD III -Special	0	0	0	0	0	0	0	0	53
Total:	2,248	765	1,096	772	882	880	246	901	413
9. Unsuitable forest land (items 3, 4, 5, 6, and 8)	9,905	8,422	8,753	8,429	8,539	8,537	7,903	8,558	8,070
10. Total suitable forest land (item 2 minus item 9)	**73**	**1,526**	**1,225**	**1,549**	**1,439**	**1,441**	**2,075**	**1,420**	**1,908**
11. Total national forest land (items 1 and 2)	16,938	16,938	16,938	16,938	16,938	16,938	16,938	16,938	16,938

[1] Beach fringe and scenic viewshed with the timber emphasis LUD

Silvicultural Systems and Practices

This section describes vegetation management practices prescribed in the Forest Plan including regeneration methods, reforestation, and intermediate treatments. Definitions for each of these practices, how they will be applied, and expected effects on the timber resource are provided.

Regeneration Harvest Methods

For modeling and planning purposes, the Forest Plan considered three regeneration methods: clearcutting (even-aged system), clearcutting with reserves (two-aged system), and group selection (uneven-aged system). This does not mean that these are the only three regeneration methods that will be considered for use on the Tongass. Other even-aged methods such as seed tree and shelterwood, while utilized to meet specific objectives, would be similar to clearcut with reserves in regards to appearance and effects. For this reason, only one of the three methods was modeled and displayed. These regeneration methods can be applied to all timber types on the Tongass (USDA Forest Service, 1983). In addition, other regeneration methods may be applied on a limited scale to test their utility in achieving other forest management objectives, such as the Silvicultural Alternatives to Clearcutting in the Old-Growth Forests of Southeast Alaska study now underway.

Implementation of any Forest Plan alternative would include a full array of silvicultural prescriptions, including modification of these methods, depending on the site-specific conditions. The choice of the regeneration method and rotation length is based upon site specific analysis done at the project level, considers multiple resource needs and objectives, and includes the rationale for using the selected regeneration method. This is documented in the silvicultural prescription, which must be approved by a certified silviculturist.

Clearcutting (even-aged system). Clearcutting is the harvesting of all merchantable trees in a stand in one harvest entry with the intention of establishing a new stand of uniform age and size. Where the primary origin of the new stand is from advanced regeneration (existing seedlings and/or saplings), the harvest method is called overstory removal.

In 1992, the Chief of the Forest Service directed that clearcutting be limited to areas where it is essential to meet forest plan objectives and which involve one or more circumstances. The circumstances under which clearcutting is practiced on the Tongass are:

- Control of dwarf mistletoe, a disease that almost exclusively infects western hemlock (Hennon, 1995).
- Eliminates the risk of blowdown of residual trees (Harris, 1989).
- Eliminates the risk of logging damage to residual trees. The tree species found on the Tongass are thin barked, easily damaged during timber harvest operations, and susceptible to heartrot and other diseases (Harris and Farr, 1974).
- Encourages germination and growth of Sitka spruce, a tree species that is more shade intolerant than western hemlock (Harris and Farr, 1974).

In addition to the above circumstances that meet the Chief's direction, clearcutting is practiced for the following reasons:

- Is an efficient and cost effective method for harvesting timber (Harris and Farr, 1974).
- Improves forest yields by converting highly defective and slowly growing old-growth to vigorous young-growth (Harris and Farr, 1974).
- Raises soil temperatures, hastening organic matter decomposition rates to release soil nutrients that become available to the new stand (Gregory, 1956; Wiant, 1967).
- Reduces the amount of road construction and sediment transported to streams resulting from road construction (Harris and Farr, 1974).

National Forest Management Regulations and Alaska Regional Guide requirements limit the maximum size of created openings to 100 acres with a few exceptions as described in the Forest-wide standards and guidelines.

Clearcutting with reserves (two-aged system). Clearcutting with reserves maintains a portion of an existing stand (a minimum of 15 percent, with 70 percent of that in clumps or groups), creating a two-layered structure with two or more age classes. Research and experience with this method is extremely limited in Southeast Alaska. The ideas behind using this method in Southeast Alaska are to:

- Provide biological and structural diversity in stands by leaving standing green trees individually or in groups.
- Reduce the impacts to scenic resources.
- Provide better protection of landslide prone sites by retaining a living root system.

Group Selection (uneven-aged system). The group selection method prescribes the removal of small groups of trees to create openings in the stand. The forest created using this method is a mosaic of small groups of trees of uniform age and height with the goal of regenerating an uneven-aged stand structure across the landscape. Group sizes range from 0.1 acres to approximately 2 acres in size. Research and experience with this method is extremely limited in Southeast Alaska. The ideas behind using this method in Southeast Alaska are to:

- Protect excessively steep or unstable soils.
- Reduce the impacts to scenic resources.
- Reduce impacts to wildlife resources.

Table 3-51 displays the annual number of acres scheduled for each of these regeneration methods, by alternative for the first decade of the Plan. The acreages displayed are for modeling purposes only to estimate Forest Plan outputs and does not limit the managers ability to utilize any regeneration method to best meet project goals and objectives.

Table 3-51
Vegetative Management Practices

Average Annual Harvest Acres of Suitable Lands Modeled in First Decade Alternative[1]	2	3	4	5	6	7	8	9
Regeneration Harvest								
Clearcut	16,768					23,207		17,709
Clearcut w/Reserves		9,386	4,943	4,712	12,318		12,325	
Group Selection		48				35		38
Regeneration Treatments [2]								
Natural & Artificial	16,768	9,434	4,943	4,712	12,318	23,241	12,325	17,747
Intermediate Treatments								
Precommercial Thinning	6,300	6,300	3,150	3,150	6,300	6,300	6,300	6,300

Source: FORPLAN table F10.1 (Forest-wide Activity and Output Results)
[1] Alternative 1 is not displayed because it doesn't have any scheduled timber harvest.
[2] Artificial regeneration would occur on about six percent of the total acres.

Variations of the above three methods include selecting leave trees based upon their species and seed producing capability to promote regeneration of preferred species (seed tree cut) or retaining greater numbers of trees to modify the micro-environment to create conditions favorable to germination and growth of preferred species (shelterwood cut). Under both of these methods, the retained trees are harvested when the new stand becomes established. Additional variations include not harvesting the retained trees (two-aged system), in which case the method would be called seed tree cut with reserves or shelterwood cut with reserves. These last two methods create two-aged stands which would be almost identical to clearcut with reserves in regards to appearance and number of trees retained. Thus, the effects would be the same as for clearcut with reserves.

Effects of Regeneration Harvest Methods to the Timber Resource

There are six major effects of these regeneration methods on the timber resource. Due to very limited research and experience with methods other than clearcutting in Southeast Alaska, effects for methods other than clearcutting cannot be quantified or predicted with high degrees of certainty.

1. **Species composition.** Of the four major commercial tree species on the Tongass National Forest, western hemlock is the most shade tolerant, followed by western redcedar, Alaska-yellow cedar, and Sitka spruce (USDA Forest Service, 1990). Western hemlock is by far the most prevalent species, making up 83 percent of the old-growth forests (Farr and McClellan, 1994). Western hemlock is susceptible to dwarf mistletoe, a disease that does not infect Alaska-yellow cedar or western redcedar and rarely infects Sitka spruce (Hennon, 1995). Western hemlock also appears to have more insect enemies than Sitka spruce (Harris and Farr, 1974). Having a diverse species mix contributes to wildlife habitat, species diversity, and minimizes losses due to insect and diseases that are species specific. In addition, western hemlock has the lowest economic value of these four species.

Five years following clearcutting, Harris (1967) reported that 53 percent of the regenerated stand was western hemlock, 41 percent Sitka spruce, and 6 percent cedars. Taylor (1934) estimated that at the end of a 75-100 year rotation period, even-aged second-growth stands would consist of about 50 percent spruce. Alaback (1982 and 1984) noted that as even-aged stands continue to age, the density of spruce decreases with a consequent increase in the density of western hemlock.

Regeneration harvest methods that create open conditions and expose bare mineral soil such as clearcutting would encourage germination and growth of Sitka spruce and the cedars. Clearcutting with reserves, leaving few reserve trees, and group sizes near 2 acres in group selection, would also encourage germination and growth of Sitka spruce and the cedars, but to a lesser degree than clearcutting due to side shading and shading from the residual overstory. Regeneration methods that create less ground disturbance and smaller openings in the canopy such as single tree selection, smaller sized groups in group selection, overstory removals, and treatments with many reserve trees would encourage growth of western hemlock at the expense of the other species.

Alternatives 2, 7 and 9 would tend to favor regeneration of Sitka spruce and the cedars. Alternative 1, which has no scheduled timber harvest, would tend to maintain species composition similar to that found in the old-growth forests. Alternatives 3, 4, 5, 6 and 8 are variable but would generally create conditions intermediate between Alternative 1 and Alternatives 2, 7 and 9. Leaving few reserve trees and/or harvesting groups near 2 acres in size would be more favorable to Sitka spruce and the cedars than leaving more reserve trees and harvesting smaller sized groups.

2. Damage to residual trees. Western hemlock and Sitka spruce are thin barked, shallow rooted species and are easily wounded during timber harvest activities (Harris and Farr, 1974; Hennon and DeMars, 1995). These wounds provide an avenue for disease organisms to enter trees, reducing their economic value and making them more susceptible to windthrow and/or windsnap. If the residual trees are expected to remain standing to provide vertical structural diversity, their falling down may mean management objectives were not met. The cedars are also susceptible to damage and subsequent attack by disease organisms. However, their wood appears to be more resistant to decay (USDA Forest Service, 1990).

On partially logged areas in the western hemlock/Sitka spruce forests of Oregon and Washington, Wright and Issac (1956) estimated that 35 percent of the residual trees were damaged. Lighter cuts (removing less volume) resulted in more residuals being damaged than heavier cuts. Hennon (1990) reported that following commercial thinning, 33 percent of the residual western hemlock and 61 percent of the residual Sitka spruce were wounded during logging activities. The amount of decay to expect from this damage has not been quantified and is difficult to estimate due to very little research and the fact that most trees in the old-growth forests are already scarred or wounded due to natural or human related events. Farr et al (1976) reported that total defect accounts for about 31 percent of the gross board-foot volume in old-growth forests of Southeast Alaska. Hennon and DeMars (1995) found that decay from scars 11 to 34 years old accounted for less than 5 percent of gross tree volume in six even-aged stands studied in Southeast (63 to 116 years old). They suggested that decay rates may be slower in Southeast (when compared to Oregon and Washington) because of lower temperatures. Studies showing how long damaged trees remain standing have not been done.

Clearcutting and group selection (opening sizes greater than 1 tree height in diameter) remove residual trees and create opening sizes large enough to fall a tree within cutting area boundaries. Thus, damage to residuals is confined to trees surrounding units. This damage is controlled through contract clauses and can be kept to a minimum. Other regeneration methods such as clearcut with reserves and group selection (openings less than 1 tree height in diameter), which leave residual trees in harvest units and create smaller openings, would likely result in trees within and surrounding cutting area boundaries becoming damaged. These wounds will likely become infected with decay and weaken the tree. If standing trees are left to provide vertical structure, they may not remain standing as long as undamaged trees. This could have an effect on whether management objectives are being met or not. As these residual trees age and snap-off or blowdown, they will also damage the regenerating stand.

Alternatives 2, 7 and 9 would damage the fewest number of residual trees. These alternatives would have similar results. Alternative 1, which has no scheduled timber harvest, would tend to maintain conditions found in the old-growth forests. Alternatives 3, 4, 5, 6 and 8 are variable but would generally result in more trees being damaged than Alternatives 2, 7 and 9. Leaving more residual trees would increase both the risk of damage and the number damaged.

3. **Blowdown.** The shallow-rooted character of western hemlock and Sitka spruce, frequent fall storms, abundant rainfall, shallow soils, complex topographic features, cyclonic wind patterns, and other factors make the forests of Southeast Alaska very susceptible to windthrow (Harris and Farr, 1974). Harris (1989) noted that blowdown is the most important natural process in renewing the forest in Southeast. He observed that most old-growth stands are composed of more-or-less even-aged trees arranged in complex patterns. In a study of blowdown on Prince of Wales and adjacent islands, he found that about half of the blowdown was complete (few or no trees remained standing) and the rest was partial (10-90 percent of the trees remained standing). The size of blowdown patches ranged from 2 to 175 acres with an average size of 18 acres. Assuming that 15 years is the maximum time that complete blowdown can be identified on aerial photos, a total of 18,537 acres blew down between 1958 and 1972. Small areas of blowdown (less than 2 acres) were not included nor were stands where isolated single trees or small groups blew down. Because scattered single trees or small groups often blow down, the author felt that total blowdown was probably greatly underestimated. In addition, an estimated 1,000 acres that blew down in 1968 and were salvaged prior to the date of the aerial photography used were not included in the acreage estimate.

On Northeast Chichagof Island, Garvey (1995 preliminary information) found similar results. He found that 47 percent of the blowdown left 0-10% of trees standing and the remaining 53 percent had more than 10 percent of the trees standing. The average size of blowdown patches was 34 acres with one patch being 434 acres in size. Only blowdown patches 5 acres or larger in size were considered in this study.

There is very little research on the size of opening that can be created without risking blowdown of adjacent stands or the percent of a stand that can be removed without risking the residuals within the unit blowing down. The distribution of blowdown across the landscape is highly variable and is dependent upon such factors as forest type, current condition of the forest, slope, aspect, elevation, soils, prevailing wind direction and wind speeds (Harris, 1989). Some areas are prone to windthrow on a regular basis while other areas experience windthrow infrequently. In the western hemlock/Sitka spruce/Douglas-fir forests of Oregon and Washington, Wright (1956) found that cuts that removed more than 20-25 percent of the board foot volume resulted in considerable blowdown of the residual stand. He found that anywhere from 50 percent to 85 percent of the residual stand blew down within 10 years following logging.

Clearcutting, by removing the trees within the cutting boundary, confines windthrow to adjacent stands. If unit boundaries are not designed properly, this loss can be considerable and continue over several years (Harris, 1989). Also, smaller harvest unit sizes, such as group selection, increase the amount of adjacent stands that are exposed to wind. This may increase the total amount of windthrow that occurs (Harris and Farr, 1974). Clearcutting with reserve trees generally opens stands up to the point that risk of windthrow to residual trees within unit boundaries and adjacent stands in increased. Leaving reserve trees in clumps may improve the chances of some residuals remaining standing. In all cases, however, losses to windthrow can be minimized through careful design of harvest units, consideration of past wind activity, and topographic position, and choosing the regeneration method that best mimics natural disturbance patterns.

Alternatives 2, 7 and 9, by removing all trees within a unit, would confine windthrow to adjacent stands. These alternatives rank the same. Alternatives 1, 3, 4, 5, 6 and 8 are variable. Removing more than 20 to 25 percent of the volume and/or creating a number of small openings would increase the likelihood of blowdown of the residuals. However, this effect is very site specific and is highly dependent upon natural wind patterns and intensities.

4. Dwarf mistletoe. Dwarf mistletoe is a parasitic plant that infects western hemlock. It is rarely found in Sitka spruce and has not been reported in the cedars. Dwarf mistletoe reduces height growth, causes growth loss, and reduces wood quality (Hennon, 1995).

Dwarf mistletoe is one of the most important diseases of western hemlock in Alaska (Hennon, 1995). It is most abundant where all-aged forests exist and understory trees are constantly exposed to dwarf mistletoe seeds from above (Shea and Stewart, 1972). Studies in British Columbia found that lightly infected trees have no measurable growth loss, moderately infected trees lose about 23 percent growth, and heavily infected trees about 40 percent growth. These studies did not involve older trees (trees greater than 150 years old) but it is predicted that growth loss in old, slow-growing trees would likely exceed that of fast-growing younger trees (Hennon, 1995). Heavy infections can also result in top-kill or tree death. In general, height growth is more seriously affected than diameter growth for a given degree of infection (Hawksworth, 1978). Height growth loss of 81 percent has been reported (Smith, 1969). While estimates of annual losses by hemlock dwarf mistletoe have not been made for Alaska, in Oregon and Washington they are estimated to be 42 million cubic feet (Childs and Shea, 1972).

Clearcutting tends to eliminate dwarf mistletoe from the stand by removing the seed source and producing a vigorous, new stand that can grow faster vertically than the disease can spread (Hennon, 1995). Regeneration methods that create numerous small openings, such as group selection, retain a source of dwarf mistletoe seed, producing slower growth in hemlock and favoring the short-range dispersal mechanism of the disease. These factors contribute to the maintenance or increase in dwarf mistletoe in the stand (Hennon, 1995). Leaving dispersed reserve trees that are infected with dwarf mistletoe will result in discrete infection centers of young-growth trees around the residuals with uninfected or lightly infected young-growth trees between (Hennon, 1995). Diameter limit harvests tend to remove large trees and retain smaller ones. Considerable infection may occur in the smaller trees that remain. However, on productive sites, the height growth of the residual trees may be such that they can outgrow the vertical spread of the parasite (Hennon, 1995).

Despite its adverse effects to timber production, the brooms caused by dwarf mistletoe infection provide nesting sites and hiding cover for some species of birds. Several animals also use dwarf mistletoe for food. This indicates that light levels of infection may be desirable to wildlife and species diversity (Hennon, 1995).

Alternatives 2, 7 and 9 would tend to control dwarf mistletoe. These alternatives rank the same. Alternative 1 which has no scheduled timber harvest, would tend to maintain levels of dwarf mistletoe found in old-growth forests. Alternatives 3, 4, 5, 6 and 8 are expected to be variable in control of dwarf mistletoe. Harvesting trees in larger groups (near 2 acres in size) could create patches of uninfected or lightly infected regeneration. Leaving few infected residuals scattered throughout harvest units may create isolated pockets of dwarf mistletoe that would have little effect on the regenerating stand. Leaving many infected trees scattered throughout the unit or harvesting smaller groups could result in infection levels in the new stand similar to Alternative 1.

5. Growth rates. Estimation of future yields from young-growth stands created by timber harvest are critical for developing allowable sale quantities for the Tongass Plan Revision. Growth and yield tables have been developed for even-aged stands in Southeast Alaska (Taylor, 1934; Farr, 1984). Published growth and yield tables have not been developed for stands regenerated under two-aged or uneven-aged methods.

Given that over 30 percent of the volume in old-growth stands is defective (Farr, 1976), it is unlikely that these trees would respond to the additional growing space made available through partial harvest. Even the older even-aged stands are generally beyond the age where partial removal of the stand would improve the growth of the remaining stand (Harris and Farr, 1974). Farr and Harris (1971) observed that several 96-year-old stands in Karta Bay did respond to thinning but the degree of the response was not quantified. Oliver and Larson (1990) note that when suppressed trees are released, they may exhibit poor growth form.

Growth rates of trees growing under a canopy are not available for Southeast and very few studies have been done elsewhere. A study done on Douglas-fir in Washington showed that leaving five overstory trees per acre reduced the height growth of the regeneration by almost 15 percent. Leaving 10 overstory trees reduced the height growth of the regeneration by 20 percent and leaving 20 overstory trees reduced the height growth of the regeneration by 50 percent. Leaving more than 20 overstory trees resulted in mortality of the regeneration (Wampla, 1993). While Sitka spruce is more shade tolerant than Douglas-fir, it is reasonable to expect some growth loss when Sitka spruce is growing under residual overstory trees.

Clearcutting creates open conditions and even-aged stands where growth and yield can be predicted. While group selection creates openings up to two acres in size, information presented above indicates that some growth reduction would more than likely occur due to the fact that the regeneration would be under the influence of side shading part of the time. The closer regeneration is to boundaries, the greater the anticipated reduction in growth. Clearcut with reserves would also reduce growth with greater reductions occurring where more trees are retained.

Alternatives 2, 7 and 9 would create even-aged stands where growth and yield of the new stand can be predicted. Overall stand growth would be highest under these alternatives. These alternatives rank the same. Alternative 1 would create stands where there is considerable uncertainty in the growth and yield of the new stand. The effects on growth rates resulting from implementing Alternatives 3, 4, 5, 6 and 8 would be variable. Generally speaking, growth rates of the new stand would probably be greater than under Alternative 1 but less than under Alternatives 2, 7 and 9. Leaving few residual trees or harvesting larger groups (near 2 acres in size) would result in higher growth rates compared to leaving many residual trees or harvesting smaller groups. There is also uncertainty in the growth and yield of the new stand.

6. Site productivity. Taylor (1933) observed that growth and vigor of shrubs and conifer seedlings increase greatly after clearcutting and that clearcutting has the effect of rejuvenating a site. Stephens et al (1969) reported finding site index to be reduced about 20 units when stands originate after blowdown. Harris and Farr (1974) note that clearcutting allows more solar radiation to reach the forest floor, thus raising soil temperature and hastening biological decomposition of the thick organic mat, resulting in increased nutrient availability. While this hypothesis has not been tested, the above discussion indicates that more open conditions, such as those created by clearcutting, improve site productivity for some time. Those regeneration harvest methods that leave shade cover would retard organic matter decomposition and thus nutrient availability.

Recent work by Bormann (Bormann et al, 1995) in Southeast Alaska indicates that windthrow may be important in maintaining long-term soil productivity. The authors found that with lack of windthrow or other soil disturbance events, an impermeable layer forms in the soil that restricts soil drainage. This leads to accumulations of organic material and reduces site productivity. Windthrow breaks up this impermeable layer, mixes the soil layers, and increases biological decomposition which in turn increases nutrient availability. This impermeable layer can form in 350-400 years. Thus, management activities such as clearcutting that remove all standing trees from an area over successive rotations may cause the site to become excessively organic and reduce the productive potential of the soil. However, the amount of soil disturbance necessary to maintain long-term productivity has not been determined. This hypothesis needs further testing.

Concern has also been raised that clearcutting of forested wetlands may cause the water table to rise, thus reducing the rate and amount of decomposition and thereby reducing site productivity. Regeneration harvest methods such as group selection and clearcut with reserves may retain enough trees on site to reduce the effects of the raised water table. This hypothesis has not been tested.

Alternatives 2, 7 and 9 would tend to increase site productivity for some period of time following harvest. The duration of this increased productivity is not known. These alternatives would have similar results. Alternative 1 which has no scheduled timber harvest would tend to maintain soil productivity at current levels. The effects of implementing Alternatives 3, 4, 5, 6 and 8 on site productivity would be variable. Generally speaking, future site productivity would probably be greater than under Alternative 1 but less than under Alternatives 2, 7 and 9. Leaving few residual trees or harvesting larger groups (near 2 acres in size) would probably increase local site productivity but the degree and duration of this increased productivity are not known. Leaving many residual trees or harvesting smaller groups would create conditions similar to Alternative 1.

Reforestation

The National Forest Management Act of 1976 requires assurance that all areas receiving final removal harvest can be adequately restocked with trees within five years of that harvest. On the Tongass National Forest, natural restocking, from advance regeneration and seeding is usually adequate to meet this objective. Since 1988, natural regeneration has accounted for 94 percent of the reforestation program. The remaining 6 percent has been artificial regeneration (planting). The future need for planting will be determined on a site-specific basis to achieve management objectives such as increasing the abundance of Sitka spruce where western hemlock or brush may have a competitive edge or increasing the abundance of Alaska yellow-cedar or western redcedar where natural regeneration of these species is anticipated to be inadequate. The desired species composition, required number of seedlings, and method of regeneration should be displayed in the silvicultural prescription. Table 3-51 lists the acres requiring reforestation (natural or artificial) by alternative.

Intermediate Treatment Methods

The composition, health, value, and growth of a stand of timber can be improved through the application of intermediate treatment methods. Forest-wide standards and guidelines identify four types of intermediate treatments: precommercial thinning, cleaning, pruning, and commercial thinning. Of these, only precommercial thinning is scheduled in the Forest Plan. The other methods may be applied on limited scales to identify their utility in Southeast Alaska. Precommercial thinning is used because it:

1. Can be used to favor preferred tree species (Harris and Farr, 1974).

2. Concentrates tree growth on fewer individuals to produce larger trees in a shorter period of time (Aulerich et al, 1982).

3. Increases the amount of light reaching the forest floor, thereby retaining understory vegetation that is valuable wildlife forage (DellaSalla et al, 1994).

Timber Management Intensity

Suitable forest land is allocated to four broad yield categories according to the intensity of timber management desired to meet management objectives for a particular alternative. Because each alternative has different resource objectives, the mixture of management intensities is also different for each.

Category I Lands: Full timber yields. These lands generally have high timber yields. The full range of silvicultural practices are available subject to being consistent with the standards and guidelines designed to provide for multiple uses. These lands are generally managed using even-aged silvicultural systems. Rotation ages for managed stands occur near the culmination of mean annual increment (CMAI), a point where the average net merchantable growth (cubic foot basis) is at its maximum level. The age at which this occurs is dependent on the species, utilization standards, site productivity, stocking, and the management applied to the stand. On well-stocked, intensively managed stands CMAI can occur as early as 60 years or as late as 160+ years.

Category II Lands: Modified timber yields. These lands have special requirements to meet other resource objectives that result in reduced yields, usually from retaining live trees or extending the conversion period. These lands are gnerally managed using two-aged silvicultural systems or uneven-aged management on the basis of small even-aged/two-aged patch cuts. In two-aged systems, live trees are retained indefinitely in groups or as individually scattered trees throughout the unit. Small patch cuts are usually on the order of 1-1/2 to 4+ acres. These patch cuts can be treated by conventional even-aged management techniques (e.g., precommercial tinning etc.). Over time, a unit could be converted to an uneven-aged mosaic of such even-aged patches without any large and visually obstrusive harvest area.

Category III Lands: Incidental timber yields. These lands are characterized by significantly reduced timber yields. Areas where maintenance of visual quality is important, sensitive riparian areas, beach buffer, stream buffers, and sensitive wildlife habitat areas are included in this category. Generally, any management of the timber resource on these lands will be for stand maintenance purposes only and will approach an uneven-aged silvicultural system. Production of high current or future timber yields is not a consideration.

Under this management regime or concept, individual trees or small groups of trees are removed if conditions indicate a disease or pest threat to the stand, imminent mortality, or severe decline in growth. This concept should not be confused with the selection system (group or individual tree) of managment. Selection implies strict stocking control and a high intensity of management to maintain growth rates, crown ratios, and overstory and understory tree vigor. Until actual selection silviculture becomes feasible on these lands, or even-aged managment can be made environmentally acceptable or the lands classified as unsuitable, yields and control considerations are secondary and other uses have priority. The Region lacks growth data for even short-term projections. Attempts to project yields through many cutting cycles with present growth and inventory data are not realistic.

A recent study of uneven-aged silviculture (Gludin, 1996) reviewed a number of case studies and the author identified some factors that are needed to successfully employ uneven-aged silviculture. These are:

- The method works best when research has developed some expertise with specific forest types. This in not the case for Southeast Alaska forest types.

- Success with this method has been in gentle terrain, a condition not typical for Southeast Alaska.

- Attention was paid to cutting the worst trees and leaving the best.

- An extended period of time-two decades or more-is usually required before a reasonable, scientifically supportable assessment can be made of the success or failure of the method in a given forest type.

Category IV Lands: No programmed yields. These lands are unsuitable for timber production and are not included in the ASQ calculation. However, non-scheduled or incidental harvests might be obtained on some of these lands in all alternatives when vegetative management was an objective. Salvage operations as well as incidental harvesting may be planned on unregulated lands if necessary to enhance other resource values.

Table 3-52 displays how many acres would be managed by yield category for each alternative. Alternatives 2, 7 and 9 propose the greatest amount of lands with a high timber yield emphasis.

Timber Supply Quantity

The expected quantity and quality of wood that each of the alternatives could contribute to the Southeast Alaska wood supply will now be discussed, focusing on:

- the allowable sale quantity and timber sale program quantity
- the factors that affect allowable sale quantity
- the allowable sale quantity and long-term sustained yield capacity
- the species composition that would be expected for the next decade
- the projected log grade or quality that would be provided
- the product mix, in terms of sawlogs and pulplogs.

Table 3-52
Timber management intensity by alternative (Thousands of acres) [1]

Alt	No Yield (Category IV)	High Timber Yields (Category I	Moderate Timber Yields (Category II)	Incidental Yields (Category III)	Total [1]
1	2,248	-	-	73	2,321
2	795	1,394	-	132	2,321
3	1,125	-	957	239	2,321
4	803	-	1,291	227	2,321
5	912	-	1,200	209	2,321
6	912	-	1,200	209	2,321
7	278	1,898	-	145	2,321
8	932	-	1,213	176	2,321
9	452	1,735	-	134	2,321

Source: Oracle Query QRegClassRS95, 21 Feb. 1996
[1] All tentatively suitable timber lands.

Allowable Sale Quantity and Timber Sale Program Quantity

The allowable sale quantities of the alterntives are an indicator of possible future timber supply levels. The ASQ is the maximum quantity of timber that may be scheduled from suitable lands for the next 10 years (36 CFR 219.3). The yearly quantity may exceed or be less than the annual average for the decade. The allowable sale quantity is a ceiling; it is not a future sale level projection or target and does not reflect all of the factors that may influence future sale levels. Given the uncertainties inherent in developing ASQs, shortfalls between the ASQ and timber sales should be expected.

The ASQ is an expression of the biological potential of the forest regulated to produce timber within the constraints of other resource needs; it is constrained by harvest limitations necessary to meet long-term sustained yield requirements, multiple-use considerations, and environmental restrictions. Changes in the timber land base, timber inventory or silvicultural prescriptions would affect ASQ.

An ASQ is, to some extent, imprecise because it is based on estimating techniques and forest-wide data rather than on detailed, on-the-ground data from the timber sale area. For example, variation from the mean timber volume by stratum is expected within smaller land divisions. The actual volume harvested should approach the Forest average over a number of Managment Areas over all Districts. If this is not the case, a plan amendment or revision may be needed.

The Timber Sale Program Quantity (TSPQ) is that portion of the timber inventory that is scheduled for sale for a specific year. The TSPQ includes harvests from unsuitable lands and convertible products (such as fuelwood and beach log salvage) in addition to the Allowable Sale Quantity. It is determined annually on the basis of silvicultural direction, current demand, funding, and multiple-use direction.

Table 3-53 displays the sale quantities that could result from implementing each alternative. The ASQ is composed of two categories: sawlogs and utility logs. There is no scheduled yield from Alternative 1, since the entire suitable land base is allocated to the incidental yield category. Five of the nine alternatives provide an ASQ that is greater than 300 MMBF. Alternatives 5 and 6 have the same suitable timber base, but the ASQ for Alternative 5 is 38 percent lower than the ASQ for Alternative 6; this is a consequence of the difference in rotation lengths (100-years vs 200-years).

Table 3-53
Allowable Sale Quantity and Timber Sale Program Quantity (1st Decade, Average Annual)

Alt	Sawtimber (MMCF)	Utility (MMCF)	Total (MMCF)	Total (MMBF)
1	0.0	0.0	0.0	0.0
2	104.7	15.6	120.3	488.6
3	59.5	8.8	68.3	278.2
4	31.1	4.6	35.7	145.4
5	29.6	4.4	34.0	138.5
6	77.5	11.8	89.3	362.4
7	146.2	22.5	168.7	688.6
8	77.8	11.4	89.2	364.0
9	109.9	16.2	126.1	513.0

MMCF = Million Cubic Feet
MMBF = Million Board Feet

Factors Affecting The Allowable Sale Quantity

Within management areas where timber yields are compatible with the resource objectives of the area, there may be "intrusions", "physical factors" and "unmapped" standards and guidelines which limit timber management opportunities. These factors, often termed “falldown,“ have been recognized at the Forest level, and the anticipated timber output adjusted appropriately. These limitations may include lands that are not capable of supporting a sustained timber management program. In other cases, where there are physical limitations, a less intensive or perhaps unregulated output may be scheduled for this period. Other factors also contribute to differences between ASQ's and timber sales: budgets and legal challenges.

The forest-wide estimates used to develop the ASQ considered some of the factors contributing to differences between ASQ's and timber sales. Taken into account were those factors that affect the suitability determination of forest lands and usually encountered in on-the-ground examinations (e.g., sale reconnaissance, stand exams, layout, and sale preparation). For each alternative, acres were set aside (not scheduled for harvest) to allow for those factors most often encountered. Data from previous case studies, monitoring, site visits, inventory data, the GIS batabase, and the new timber type map were used to develop the acreage estimates (see Appendix B for more information).

More specifically, the following questions were considered:

1. Is it tentatively suitable? (36 CFR 219.14(a))

   Appendix A of the proposed Forest Plan outlines the process used to determine the tentatively suitable land base. The three most common factors encountered during project implementation are: unmapped streams that need TTRA buffers; unmapped extreme hazard soils; and forest land incorrectly mapped as capable of growing industrial wood products.

2. Is it appropriate for timber production? (36 CFR 219.14(c and d))

Multiple-Use Objectives and Management Requirements. The proposed Forest Plan standards and guidelines were reviewed for elements that are not mapped or in the GIS database and that could cause a loss of suitable acres. These were:

Karst and caves. For alternatives using the Karst and Caves standards and guidelines, the high vulnerability landscapes have been mapped and taken out of the suitable base; however, low to moderate rated landscapes have not been. These landscapes often contain areas with significant karst and cave features that are often identified during project planning and implementation.

Unmapped Class III stream buffers. The Tongass has an incomplete inventory of Class III streams. Alternatives 3, 4, 5, 6 and 8 have significant buffer requirements for these streams.

Deer Standards and Guidelines. Alternatives 1, 3, 4, 5 and 6 require that important deer winter range be maintained in areas where average deer harvest exceeds 10 to 20 percent of deer habitat capability.

New Bald Eagle/Osprey Nests. These require 330-foot radius habitat management zones.

600-foot landscape linkages. These are landscape corridors connecting old-growth blocks.

New Goshawk nests. These require 100-acre management areas.

Non-enacted municipal watersheds.

New Murrelet nests. These would receive 600-foot buffers.

Active wolf dens. These receive 600-foot forested buffers.

Important mountain goat winter habitat and travel corridors.

Land selections. State and Native land selections not yet conveyed.

Summary: Table 3-54 displays the acreage that was assign a no-harvest prescription to allow for the above factors. This is called the "implementation adjustment." Deer, karst and caves, land selections, isolated stands, and Class III buffers account for the majority of the acres. The amount of suitable timber base actually scheduled by alternative (excluding Alternative 1, which has 0%) ranges from 58 percent in Alternative 4 to 82 percent in Alternative 2. In the 1991 SDEIS, 94 percent of the suitable base was scheduled (Alternative P).

Table 3-54
Implementation adjustments by alternative

Alt	Suitable Timber Base	Implementation Acres (Thousands of Acres) [1]	Scheduled Timber Base Periods 1-15	Scheduled as a % of the Suitable Timber Base
1	73		0	0
2	1,556	253	1,252	80
3	1,225	283	831	68
4	1,549	310	879	57
5	1,439	270	827	57
6	1,441	270	1,081	75
7	2,075	359	1,691	81
8	1,420	246	1,085	76
9	1,908	312	1,325	69

[1] Also known as "model implementation reduction acres."

Cost efficiency: The Tongass Timber Reform Act provides that:

> ANILCA is further amended by deleting section 705(d)(16 U.S.C. 539d(d)) in its entirety and inserting in lieu thereof:
> (d) All provisions of section 6(k) of the National Forest Management Act of 1976 (U.S.C. 1604(k)) shall apply to the Tongass National Forest except that the Secretary need not consider economic factors in the identification of lands not suited for timber production. (TTRA, Sec. 102.)

Economics is an important consideration in determining whether lands should be harvested; however, experience has proven that it is not feasible to effectively factor in economics as part of the 10-year timber suitability determination. There are various reasons why:

1. Economic conditions fluctuate greatly during the course of a plan period. One year a certain area of land or species may be uneconomic to harvest, and another year market conditions may have changed to where the same area or species would be in demand. This makes it difficult to meaningfully assess the economics of harvesting a paricular site over a 10-year period.

2. The value of the timber sale program must be considered as a whole rather than by only evaluating individual timber sales or harvest units in isolation, since some sales or units of low value are offset by other higher-value sales or units.

3. The timber program also must be viewed with consideration of non-market contributions, such as enhanced hunting use, fuelwood gathering, and motorized recreation, and not strictly timber sale costs and receipts.

4. Economic considerations can be adequately addressed through other means. For example, forest plan standards or non-interchangeable components can be established to limit harvesting due to economic reasons. In addition, economic considerations can be considered as part of the program development and budget process.

5. Economics of harvesting any particular site can be considered as part of the project decision to approve harvest of the area.

Two strategies were employed to address the economic issues:

1. Isolated stands of low to medium volume and low volume stands of difficult operability were assigned a non-harvest prescription.

2. The remaining economically and technologically marginal lands were scheduled for harvest but assigned to a non-interchangeable component (discussed below).

Non-Interchangeable Components

Non-interchangeable components (NIC's) allow for separating discrete quantities of the ASQ into individually accountable categories. Chargeable timber volume from one NIC cannot be substituted for the achievement of the volume limit of another NIC. Limits on the sale of chargeable timber volume associated with each noninterchangeable component cannot be exceeded, and chargeable timber volume from one noninterchangeable component cannot be attributed to the volume limit associated with another noninterchangeable component.

Component I: Normal or standard operable volume. This is volume that would be scheduled from suitable lands using existing logging systems (e.g. high-lead, single-span skyline, shovel, and helicopter with yarding distances less than one-half mile). This is the best operable ground and it usually consists of normal operability and a small component of difficult operability. This is the ground were the Forest has been offering sales since 1980 and has consisted of (on an acre basis) 94 percent normal operability and 6 percent difficult operability. The timber program has been above cost, as reported by the Timber Sale Program Information Report System (TSPIRS), for four of the past eight years. Given the trend in budgets, this is the component that is most likely to produce the Timber Sale Program Quantity.

Component II: Non-Standard Operable Volume. This is volume scheduled from suitable lands that are available for harvest using advanced logging systems not in common use (e.g. helicopter, balloon, and multispan skyline). These lands are presently considered economically and technologically marginal. This volume is rarely economic and usually can only be attained by additional investment (i.e., pre-roading and advanced logging technology).

Table 3-55 shows the breakdows of the non-interchangeable components by alternative for decade 1. About 16 to 17 percent of the FORPLAN-derived ASQ's are NIC II volume. The NIC II portion could be considered “high risk” volume, or volume that has a low probability of attainment.

The comparable NIC I component, since 1980, has usually consisted of 94 percent normal operability and 6 percent difficult operability (acre basis). Table 3-56 displays the scheduled acres by component. The NIC I component is composed of 94 percent normal operability and 6 percent difficult operability; the NIC II component consists of difficult and isolated operability.

Table 3-55
Average Annual First Decade Allowable Sale Quantity (ASQ) and Non-Interchangeable Components (NIC's).

Alt.	Average Annual ASQ (1)	NIC I (1)	NIC II (1)	Average Annual ASQ (2)	NIC I (2)	NIC II (2)
1	-	-	-	-	-	-
2	120.3	100.0	20.3	488.6	406.3	82.3
3	68.3	57.0	11.3	278.2	232.0	46.2
4	35.7	29.8	6.0	145.4	121.2	24.2
5	34.0	28.1	5.9	138.5	114.4	24.1
6	89.3	74.0	15.3	362.4	300.3	62.1
7	168.7	141.3	27.4	688.6	576.7	111.9
8	89.2	74.7	14.5	364.0	304.7	59.3
9	126.1	116.5	9.6	513.0	474.0	39.0

(1) Million cubic feet
(2) Million board feet

Table 3-56
Scheduled Harvest acres by NonInterchangeable Component

Alt.	Period (decades)	NIC I (acres)	NIC II (acres)	Total (acres)
1	1	-	-	-
	1 to 5	-	-	-
	1 to 10	-	-	-
2	1	139,199	28,473	167,672
	1 to 5	717,031	153,488	870,519
	1 to 10	1,251,473	260,044	1,511,517
3	1	78,383	15,955	94,338
	1 to 5	411,081	84,623	495,704
	1 to 10	751,139	158,835	909,974
4	1	42,222	7,210	49,432
	1 to 5	220,917	37,474	258,391
	1 to 10	450,254	78,943	529,197
5	1	38,820	8,300	47,120
	1 to 5	199,669	42,337	242,006
	1 to 10	407,510	87,472	494,982
6	1	101,986	21,192	123,178
	1 to 5	533,824	111,184	645,008
	1 to 10	974,599	211,810	1,186,409
7	1	194,193	38,221	232,414
	1 to 5	1,014,938	212,460	1,227,398
	1 to 10	1,808,582	365,376	2,173,958
8	1	102,987	20,266	123,253
	1 to 5	535,024	105,856	640,880
	1 to 10	967,544	206,032	1,173,576
9	1	172,935	4,535	177,470
	1 to 5	897,294	24,714	922,008
	1 to 10	1,563,141	41,135	1,604,276

Other Factors that Affect the Timber Sale Program Quantity

Budgets. The amount of funding that the Forest receives also affects the Timber Sale Program Quantity. Often this factor can be more significant than changes in suitable acres. The ASQ of the Current Plan is 450 MMBF (sawlog); however, the average funded Timber Sale Program Quantity from 1980 through 1995 was 404 MMBF or 90 percent of the ASQ (Table 3-57). The average funded level for the past 5 years (90-94) was 380 MMBF or 84 percent of the ASQ. The portion of the ASQ that was actually sold or release (80-95) averaged 304 MMBF or 68 percent of the ASQ.

Table 3-57
Timber Program Funding

Program Components		Percent ASQ Funded	Range in Values (80-95) (MMBF)
ASQ (sawlog, MMBF)	450		
Funded (80-95)	404	90%	306 to 465
Funded (90-94)	380	84%	320 to 477
Sold/Released (80-95)	304	68%	171 to 496

The cost of preparing timber sales has risen steadily over the past few years due to increased costs of environmental and GIS analysis, planning, resource support and the appeals/litigation process. Forest Service costs were around $30 per MBF harvested in 1988 and by 1993, rose to about $80 per MBF harvested; NEPA/planning costs were about 16 percent and 33 percent respectively of the total. As per unit costs have been rising, the amount of volume offered has been declining. Forest Service costs would be significantly higher in those Alternatives that utilize the two-aged silvicultural system; identifying the retention areas would require additional time and expense.

Appeals and Legal Challenges. Administrative appeals and lawsuits affect the continued availability of an adequate and consistent timber supply. Table 3-58 displays the appeal litigation history for 1991 through 1996. Since 1991, over 1.1 billion board feet has been appealed or litigated. About 648 million has been subsequently released, almost 400 million is still unresolved, and almost 100 million board feet has been dropped from the timber sale projects being challenged (about 9 percent of the total).

Factors Not Addressed. Only those project items (Model Implementation Reduction Factors) that would change the suitability designation of currently suitable lands are incorporated into the FORPLAN model constraints. Project decisions that affect scheduling, mapping errors (office vs. field measurements), office vs. field discrepancies, dispersion requirements, differences in sale planning philosophies, cumulative watershed constraints, logging system decisions, appeals/litigation, and other similar items are not factored into the FORPLAN model constraints. The volume from these lands, while not available for harvesting immediately because of project or court decisions, would still be part of the suitable timber base for ASQ calculations.

Table 3-58
Appeal and Litigation History for 1991 - 1996.

Year	Sale Name	ROD Volume [1]	Volume Affected
1991	Frosty Bay	26	Appeal Withdrawn
1991	North Sea Otter Sound	34	Appeal settled. Settlement agreement allowed about 28.5 to go forward
1991	Starfish	44	Appeal dismissed (untimely)
1992	Bohemia	38	Decision withdrawn, no volume released.
1992	Salt Lake	6.7	Decision reversed on appeal. Revised EA also authorized 6.7 MMBF
1992	Kelp Bay	117	This appeal was affirmed, but the WLF Society successfuly litigated it. All ROD approved volume was allowed to go forward, but 53.4 MMBF was subsequently enjoined by AWRTA litigation.
1993	Southeast Chichagof	127.6	Decision affirmed on appeal, but 63.3 MMBF subsequently enjoined by AWRTA litigation
1993	North and East Kuiu	136	123.2 MMBF stayed while appeal reviewed. Later released, but 123.8 MMBF subsequently enjoined by AWRTA litigation.
1993	CPOW	267	Decision affirmed on appeal, but subsequently litigated. Approximately 98 MMBF was released, remaining volume was susupended pending completion of a Supplement to the FEIS. Supplement shows 214 MMBF.
1994	North Revilla	205	Decision affirmed on appeal.
1994	North Irish	4.8	Decision withdrawn and volume not sold.
1994	Bohemia	34	Decision reversed, no volume released.
1995	Ushk Bay	67	Decision affirmed on appeal. Approximately 600 MBF dropped in negotiations with State during ACMP review.
1995	Polk Inlet	64.5	Appeal withdrawn.
1995	Bohemia	34	Decision affirmed on appeal.
1996	Neka	33	AWARTA Litigation
	Gallagher	8	

[1] in MMBF

Allowable Sale Quantity and Long-Term Sustained Yield Capacity

Long term sustained yield (LTSY) is the maximum timber yield that can be sustained indefinitely from lands managed for timber production when all stands have been converted to a managed state. This varies by alternative according to the timber management strategy proposed. LTSY is a function of the total number of acres allocated to timber managment, the management intensity, standards and guidelines, silvicultural systems, and the productive capacity (conifer growth) of the suitable lands. The harvest schedule is based on: (1) a harvest schedule that exhibits non-decling yield at or below long-term sustained yield capacity, (2) a regeneration harvest age at or beyond culmination (maximum) of mean annual increment, and (3) a planning horizon of 150 years.

Table 3-59 displays the LTSY and ASQ by alternative. Estimated quantities are expressed in millions of cubic feet (MMCF). To convert these numbers to MMBF, multiply the numbers in Alternatives 4 and 5 by 4.03 for all periods and periods 1-5 in the remaining alternatives. Use 4.21 for periods 6-10 and 4.42 for periods 11 -15 for Alternatives 2,3,6,7,8 and 9. (There are approximately 4+ board feet in 1 cubic foot.)

For all alternatives, the ASQ never exceeds the LTSY during the 150-year planning horizon. Alternatives that would allocate a greater number of acres for timber management and/or have more acres under intensive management would produce the highest LTSY's. The LTSY was calculated for the sawlog volume. This results in a decline in the total cubic foot volume during the second 50-year period for Atlernatives 2, 3, 6, 7, 8 and 9. While the LTSY is based on sawlog volume, the ASQ is calculated for total (sawlog plus utility) volume. The regulations (36 CFR 219.16(a)(1)) state: For the base sale schedules, the planned sale for any future decade shall be equal to, or greater than, the planned sale for the preceding decade, provided that the planned sale is not greater than the long-term sustained-yield.

For a particular land allocation and set of yields for existing and future stands, a harvest schedule under the base harvest policy usually will reveal either a surplus or deficit of timber in existing stands. The harvest schedule, for all alternatives, indicates that there is a deficit of timber in existing stands. This is due to the fact that lands allocated to timber production cannot provide enough harvest volume from existing stands to maintain the harvest at the LTSY until the stands created from the existing cut become available for harvest. This condition is called a “shortage of existing timber" (harvest begins below the LTSY). Volume from harvest-created young-growth stands is expected to provide significantly more volume than existing old-growth stands (almost double on some sites).

Table 3-59
Allowable Sale Quantity and Long-Term Sustained Yield Capacity (MMCF) (1)

Alt	Decade 1	Decades 1 to 5	Decades 6 to 10	Decades 11 to 15	LTSY
1	-	-	-	-	-
2	120.2	121.8	112.7	124.6	135.6
3	68.2	70.3	66.1	70.4	76.7
4	35.7	37.0	37.6	37.6	67.6
5	34.1	34.9	35.1	35.1	63.4
6	89.0	91.2	85.5	90.5	99.6
7	168.7	173.7	160.9	168.9	178.0
8	89.2	90.8	85.2	89.7	98.5
9	126.1	127.8	118.7	129.7	139.6

(1) Long-term sustained yield is only expressed in the cubic foot measure.

Timber Supply Characteristics

In most of the following discussions of timber supply, comparisons are made only for the NIC I portion of the ASQ of each alternative. This is the amount that is most likely to be economically and technologically available to the timber industry over the next decade.

Species Composition

Stands differ in their species composition and grade and hence in their inherent value. The species composition is a reflection of the volume strata that would be scheduled for harvest in the first decade. The mixture of species that would be offered for sale is displayed in Table 3-60.

In Southeast Alaska, an important consideration is the occurrence of cedar. Cedar species are usually sold in separate markets. The cedar species, both western red and Alaska yellow-cedar, are minor species that usually do not provide enough volume of sufficient quality to support a local domestic industry. Much of the cedar volume is poor grade and is of little value as lumber or shingles. In addition, cedar is generally not used to produce pulp. However, high-grade logs (especially Alaska yellow-cedar) usually command high prices in the export market. These species can be exported and are usually sold in the export market. The round log export policy is currently under review by the Forest Service and could result in a restriction on cedar export.

Table 3-60
Species Composition of the NIC I Component of the Annual Allowable Sale Quantities by Alternative, Decade 1 (MMBF)

Alt	Sitka Spruce	Western Hemlock	Red and Alaska Yellow Cedar	Total [1]
1	0	0	0	0
2	133	250	24	406
3	77	143	13	232
4	40	75	6	121
5	38	70	6	114
6	100	185	16	300
7	188	355	34	577
8	100	187	18	305
9	155	290	28	474

Source: FORPLAN and timber inventory statistics.
[1] Totals may be off due to rounding

Gross Sawmill Log Delivery

Decisions regarding what log will go to the chipper rather than the saw mill will vary, depending on the market price of lumber and pulp, as well as the current available log and chip supply. Log grades are related to the quality of the products to be produced from the logs. Therefore, quality is defined in terms of some derived product, preferably the product that gives maximum value for a given log.

The proportion of each log grade that can be expected to be delivered to the sawmill was estimated using the logs sawn ratios contained in the Forest Service Appraisal Handbook 2409.22. The ratios represent data collected from the past ten years. The logs sawn ratio is the percent of each grade that would normally be delivered to the sawmill. The projected volumes are displayed in Table 3-61 for each alternative. About 57 percent of the hemlock-spruce volume would go to the sawmill, with the remaining 43 percent to the pulpmill. These numbers are used in allocating the portion of the allowable sale quantity that would go towards satisfying sawmill capacity, with the remainder designated for the pulpmill capacity.

Table 3-61
Projected Hemlock and Spruce Log Grade Compositions of the NIC I component of the Allowable Sale Quantities of the alternatives, 1st decade (MMBF)

Alt	Hem-Spruce Sawlogs	Hem-Spruce Pulplogs	Cedar Logs	Total MMBF
1	0	0	0	0
2	222	160	24	406
3	128	91	13	232
4	69	48	6	121
5	64	45	6	114
6	166	118	16	300
7	315	228	34	577
8	167	120	18	305
9	259	187	28	474

Products (sawlogs, pulplogs, chip-by-product, other)

The timber resource of the Tongass National Forest can generally be classified into four types of products: sawlogs, pulplogs (logs delivered to the pulpmill, e.g., utility logs and lower grade sawlogs), chip by-products, and other products (usually cedar export logs). Based on the species composition and log grade composition, the allowable sale quantities of each alternative were divided into the three product categories. These volumes are used to assign that portion of the ASQ that would likely go to the sawmills (sawlogs), to the pulpmills (pulplogs), and to the export market based on past experience. The results are displayed in Table 3-62. The product breakdown for all alternatives is about 49 percent sawlogs, 45 percent pulplogs (includes utility), and 7 percent export cedar logs.

Alaska's sawmills produce chip residues from the lumber manufacturing process and they also produce chips from a portion of the sawlog volume delivered to the sawmill. These chips and chip by-products are an important supply source for the remaining pulp mill in Southeast Alaska. Pulp is produced from the logs (i.e., low grade sawlogs and utility logs) delivered to the pulp mill and from the chip by-products produced from sawmills. If there is a dependable excess supply of this product, it could be used by another manufacturing facility (e.g., a medium density fiberboard plant), utilized for energy, or exported.

Table 3-62 also displays the projected chip by-product (in terms of bone dry units (BDU's)) that would be produced from each alternative's projected wood supply. The output is based on certain assumptions of product conversions, overrun, and product recovery. The assumptions we used are available in the planning record. This information is used in the socio-economic section to predict the effect the alternatives may have on the Southeast Alaska timber industry infrastructure (i.e., the sawmills and pulpmill) and the subsequent affect on jobs and communities.

Table 3-62
Projected Product Composition of the NIC I component of the Annual Allowable Sale Quantities

Alt	Gross Log Input Sawmill (MMBF)	Lumber Produced (MMBF)	Sawn Logs (MMBF)	Chipped Logs (MMBF)	MFG Residue (1)	Chip Logs (1)	Pulp Logs (1)	Total Chips & Residue (1)	Total BDUs
1	0	0	0	0	0	0	0	0	0
2	222	232	184	38	156	102	428	686	572
3	128	134	106	22	90	59	244	393	327
4	67	70	56	12	47	31	128	206	172
5	64	66	53	11	45	29	120	194	162
6	166	174	137	29	117	77	316	509	424
7	315	329	261	54	221	145	608	974	812
8	167	175	138	29	117	77	320	514	428
9	259	271	214	45	182	119	498	799	666

Gross log input = ratio of lumber production and log deliveries to sawmills, ratio is from Brooks and Haynes, 1994.
Ratio of gross log input and overrun = units are board feet of logs chipped per board feet of logs used for lumber.
(1) Thousand Dry Tons

Effects on the Timber Supply

The following discussion displays the consequences of implementing the proposed alternatives in regards to timber supply. The analysis uses the ASQ NIC I component of each alternative's timber supply potential. Given federal budget trends, the NIC I component is the most likely Timber Sale Program Quantity that would be produced. The consequences of implementing the proposed alternatives focus on the following quistions:

- How would the timber supply compare to historic harvest levels?
- Would the timber supply meet our minimum long-term contract obligations?
- Would the current long-term contract area provide the minimum volume obligations?
- How much timber would be available for an SBA program?
- Would there be a sufficient timber supply for a 10-year contract?
- What would be timber sale action plan?

1980 to 1995 Harvest Comparison

The average volume harvested per year for the first 15 years (1980 to 1995) of the current plan was about 340 MMBF (sawlog and utility). During this time period both the KPC and APC pulp mills were operating. The NIC I component of the ASQ's in the alternatives ranges from 0 to 572 MMBF, and the full ASQ's from 0 to 689 MMBF. The projected NIC I ASQ portions for alternatives 1, 3, 4, 5, 6 and 8 are not sufficient to meet sell-and-harvest levels equivalent to those of the last 15 years (Table 3-63).

Table 3-63
Historic harvest and ASQ comparisons [1]

Alt	80-94 Average Harvest [2]	ASQ NIC I	NIC ISurplus/ Deficit	ASQ	ASQ Surplus/ Deficit
1	340	0	-340	0	-340
2	340	406	66	489	149
3	340	232	-108	278	-62
4	340	121	-219	145	-195
5	340	114	-226	138	-202
6	340	300	-40	362	22
7	340	577	237	689	349
8	340	305	-35	364	24
9	340	474	134	513	173

[1] All figures are MMBF, Sawlog and utility.
[2] Includes APC harvest.

1989 to 1991 Harvest Comparison

The average volume harvested per year for fiscal years 1989 through 1991 was about 426 MMBF (sawlog and utility). This was the high point of timber harvest during the last 15 years and includes APC and KPC harvest. The average volume harvested per year for fiscal years 1989 through 1991 was about 426 MMBF (sawlog and utility). This was a period of favorable market conditions that prompted an increase in the output of manufactured wood products. In fiscal year 1989, timber from the Tongass National Forest supported nearly 45 percent of the logging employment in Southeast Alaska, and roughly 70 percent of employment in pulpmills. The projected NIC I ASQ portions for all alternatives except Alternatives 7 and 9 are not sufficent to meet the sell and harvest level equivalent to that of the 89-91 operating period (Table 3-64).

Table 3-64
1989-91 Harvest and ASQ Comparisons [1]

Alt	Average Harvest [2]	NIC I	NIC I Surplus/ Deficit	ASQ	ASQ Surplus/ Deficit
1	426	0	-426	0	-426
2	426	406	-20	489	63
3	426	232	-194	278	-148
4	426	121	-305	145	-281
5	426	114	-312	138	-288
6	426	300	-126	362	-64
7	426	577	151	689	263
8	426	305	-121	364	-62
9	426	474	48	513	87

[1] All figures are MMBF, sawlog and utility.
[2] Includes APC harvest.

Ketchikan Pulp Company (KPC) Long-Term Timber Sale Contract

The Ketchikan Pulp Company manufacturing operations consist of a pulp mill and two sawmills. KPC reports that, at full capacity, the mill requires about 423 bone dry units of chips to produce 190,000 tons of dissolving pulp. The two sawmills have a reported combined log processing capacity of about 110 MMBF. Since 1964, the KPC long-term contract harvest rate has averaged around 168 MMBF per year (Table 3-65).

Table 3-65
KPC Harvest History

Operating Period	Harvest Volume (MMBF)	Annual Average (MMBF)
1964-1969	1,022.0	204.4
1969-1974	839.6	167.9
1974-1979	863.3	172.7
1979-1984	611.4	122.3
1984-1989	761.5	152.3
1990-1994	926.9	185.4
Total (64-94):	**5,024.7**	
Annual Avg. (64-94):		**167.5**

To plan for orderly timber harvest operations, the Forest Service has historically planned for the average annual harvest of approximately 192.5 MMBF by KPC under the long-term contract. Harvesting this volume will exceed the minimum necessary to satisfy the Forest Service's obligation under the long-term contract. (The obligation is to offer sufficient timber to KPC to enable KPC to operate a pulp mill with a capacity of 525 tons per day, which has been estimated using various assumptions to be an average annual volume of wood to the pulp mill of about 154 MMBF (Contracting Officiers Decision CDA 10-93-01, December 12, 1994), but this is disputed by KPC.) However, the 192.5 MMBF planning level is considered warranted to assure that the Forest Service will meet its obligations under the long-term contract. Accordingly, the following analysis assumes a planned average annual long-term contract harvest of 192.5 MMBF.

There are about 900,000 tentatively suitable acres within the current KPC long-term contract area. The alternatives restrict harvest or reserve from harvest varying amounts of land within portions of the current contract area. Table 3-66 displays the amount of land each alternative would designate as suitable for timber management within the contract area. The amount of suitable land would vary from 2.2 percent of the tentatively suitable base in Alternative 1 to 91 percent in Alternative 7. VCU harvest thresholds in Alternatives 4, 5 and 6 drastically reduce the available harvest acres within the KPC contract area. The thresholds temporarily preclude harvest from the northern half of Prince of Wales Island (POW) for the next ten years. Riparian habitat requirements and old-growth reserves cause significant harvest reductions in Alternative 3; about 50 percent of the tentatively suitable timber base is assigned a non-harvest prescription. Alternative 1 is entirely "uneven-aged" management; it has about 20,000 acres available and only incidental yields are expected.

Table 3-66 displays the total projected outputs (sawlog and utility) and the NIC I component. The outputs are a consequence of the lands that the alternative makes available for harvest and the restrictions placed on those lands. The total projected output varies from 0 MMBF in Alternative 1 to 282 MMBF in Alternative 7; the NIC I component varies from 0 to 252 MMBF. Alternatives 7 and 9 appear to have the capability of satisfying the contractual planning needs. However, the remaining alternatives may jeopardize the Forest Service's ability to satisfy the contract planning needs from the contract area; volume would probably have to be obtained from elsewhere on the Forest.

Table 3-66
KPC long-term contract area expected outputs (total volume), Decade 1 annual average [1]

Alt	Tentatively Suitable (million acres)	Suitable (million acres)	ASQ (MMBF)	ASQ NIC I (MMBF)	Planned Contract Harvest (MMBF)	ASQ Surplus/ Deficit (MMBF)	NIC I Surplus/ Deficit (MMBF)
1	0.9	0.02	0	0	192.5	-192.5	-192.5
2	0.9	0.59	182	161	192.5	-10.5	-31.5
3	0.9	0.45	96	87	192.5	-96.5	-105.5
4	0.9	0.59	48	42	192.5	-144.5	-150.5
5	0.9	0.51	42	38	192.5	-150.5	-154.5
6	0.9	0.51	124	112	192.5	-68.5	-80.5
7	0.9	0.82	282	252	192.5	89.5	59.5
8	0.9	0.53	138	125	192.5	-54.4	-67.5
9	0.9	0.75	213	203	192.5	20.5	10.5

[1] All MMBF figures are sawlog plus utility

Table 3-67 displays the projected NIC I outputs from the Stikine and Chatham Administrative Areas. Only the alternatives projected to need volume from outside the contract area are displayed (Alternatives 1, 2, 3, 4, 5, 6 and 8). There appears to be sufficient additional volume from Chatham and Stikine in Alternatives 2, 3, 6 and 8 to meet contractual planning needs. Alternatives 1, 4 and 5 still appear to jeopardize the Forest Service's ability to meet its contract planning needs.

Table 3-67
Projected NIC I annual average output from the Chatham and Stikine Administrative Areas (1st Decade) [1]

Alt.	NIC I Chatham/Stikine Area (MMBF)	KPC Contract Surplus/Deficit (MMBF)	NIC I Contract Deficit (MMBF)
1	0	-192.5	-192.5
2	245	-32	213
3	145	-106	39
4	80	-151	-71
5	77	-154.5	-77
6	188	-86.5	107
8	179	-68	111

[1] Sawlog plus utility volumes, all species.

SBA Program

Sec 105, Small Business Set-Aside Programs, of the Tongass Timber Reform Act states that the Secretary shall, in consultation with the Small Business Administration:

> "seek to provide a supply of timber from the Tongass National Forest to those purchasers qualifying as 'small business concerns' under the Small Business Act as amended (15 U.S.C 631 et seq.)."

To facilitate the development of competitive enterprises and markets for timber resources, the Forest Service and Small Business Administration, in 1995, agreed to an annual set-aside goal of approximately 100 MMBF for the Tongass National Forest. Mills qualifying for the Small Business set-aside program are distributed throughout Southeast Alaska.

The United States Department of Agriculture, Forest Service, Alaska Region (Forest Service), and the Small Business Administration (SBA) have agreed that:

1. The independent timber sale program goal for the Tongass National Forest will be 100 MMBF per Fiscal Year (October 1, 1995 to September 30, 2000).

2. All independent sales shall be offered as SBA sales (exceptions: small salvage timber sales, resales of uncompleted contracts (defaulted sales), and previously advertised but unsold timber sales).

3. If markets change, the small business offerings may be adjusted through joint agreement.

4. The agreement will be reviewed for possible modification upon completion of the Forest Plan Revision.

Table 3-68 displays, by alternative, the volume that would be available for an SBA program. These projections are based on the NIC I portion of the ASQ of each alternative less the long-term contract planning needs.

Table 3-68
Small business program supply capability by alternative (MMBF) (1)

Alt.	Available ASQ NIC I (2)	SBA Goal	Surplus/Deficit
1	-192.5	100	-292
2	213	100	113
3	39	100	-61
4	-71	100	-171
5	-77	100	-177
6	107	100	7
7	384	100	284
8	111	100	11
9	282	100	182

(1) All figures are MMBF's, sawlog plus utility.
(2) "Available ASQ" = NIC I ASQ portion less KPC contract planning need of 192.5 MMBF

The available NIC I ASQ portions of Alternatives 2, 6, 7, 8 and 9 are sufficient to meet the 100 MMBF SBA goal. Alternative 3 could support a reduced SBA goal. Alternatives 1, 4 and 5 could not supply any timber beyond the KPC amount.

10-Year Contract

As part of the letter terminating the Alaska Pulp Corporation long-term timber sale contract (April 14, 1994), the Regional Forester included the following statement:

> "While 17 years remained under this contract, I bring to your attention the fact that the Forest Service, under authority granted by the National Forest Management Act, 16 U.S.C. 472a, may offer timber sale contracts for a period not to exceed ten years. Should APC continue to explore the economic viability of building and operating an

> MDF facility, the Forest Service has authority to prepare a ten-year timber sale package for advertisement and bidding. The ten-year period may be a sufficient length of time to assure a reasonable return on such an investment and promote the important goal of maintaining continuous, year-round employment in Southeast Alaska. The Forest Service also stands ready to continue to provide technical or other assistance within our capability with respect to means of full utilization of timber in Alaska."

In a followup letter (Ten-year Timber Sale Contract Feasibility Study, July 12, 1994) the Regional Forester concluded that the TLMP Revision would be the appropriate process for determining the advisability of proceeding with a ten-year sale offering.

The primary objectives for a ten-year contract would be to provide enough volume from an exclusive timber sale area to secure capital investments for the construction and production of an industrial wood manufacturing facility in Southeast Alaska. The economic goals would be to:

- be sustained with the available wood supply
- use environmentally compatible production processes
- provide maximum opportunities for value-added products.

The original focus of a ten-year timber sale contract was to provide employment and wood utilization to replace that lost in Sitka, Alaska with the closure of the APC pulp mill. APC had indicated that it was considering the feasibility of converting the pulp mill to a medium density fiberboard (MDF) plant. Although APC has since announced that it will not pursue a MDF facility at its site in Sitka, consideration has been given to the feasibility of an alternative manufacturing facility, primarily MDF. (Feasibility Analysis of Alternative Wood-based Industries for the City and Borough of Sitka, Alaska, International Resources unlimited, Inc., Draft Report 1995.)

MDF is an engineered panelboard product manufactured from refined wood fibers and resin. Virgin wood fiber from round wood and chips plus other wood product manufacturing residual are the primary fibers used to manufacture MDF. Wood fibers are bound together with urea formaldehyde or other resins. Bonding technology has advanced to the point where a non-formaldehyde based binder may now be economical.

Wood fibers used in MDF are refined from chips into fine particles, thus transforming wood into a homogeneous fiber unit with a more constant density across species. Other fiber sources, such as wood demolition debris, recycled paper and agricultural waste are currently being tested and used as alternative raw materials in MDF manufacturing. MDF is manufactured by extrusion pressing or by flat, mat-formed pressing. Flat-pressing represents the bulk of the current existing manufacturing processors in the USA. In this flat-press, fiber is blended with wax and resin and compressed in heated presses where the resin cures and solidifies the mixture into panels. MDF has been used for furniture manufacture, replacing scarce and expensive hardwood plywood. More recently, MDF's usage has spread to door frames, floor sheathing and wall paneling. The building industry values it for its stable price and uniformity. MDF possesses excellent machining qualities due to the small particle size of the fiber. MDF is very useful for furniture components, indoor sheeting, and ready-to-assemble products.

Sitka Spruce and hemlock found in Southeast Alaska are acceptable as raw material for MDF. The size of suitable raw material is from one and seven eighth inch chips down to sawdust. All fiber must be free from all foreign objects; the manufacturing process will tolerate not more than three percent bark content. The raw material needed for MDF comes from two basic sources. One is residuals from sawmills and other wood product manufacturers in the area. The other source is from utility logs. The vast majority of the raw material needed for a MDF in Southeast Alaska would come from the Tongass National Forest. Not only is the greatest volume of timber located on the National Forest, but federal law requires local processing. Much of State and Native harvest that takes place in the region rely on round log (unmanufactured) export to the Pacific Rim markets. Only federal timber is required to receive primary local manufacturing (add-on) before the product can be exported.

It appears to be infeasible for a MDF facility to be self-sufficient for raw material. The availability of residuals from sawmills or pulp logs require association with a sawmill. The lower quality pulp (utility) log is included as a component of timber sales. An efficient mix in a timber sale is for about 65 percent of the material to be sawn and the remainder used for pulp manufacture. A sawmill approximating the capacity of the APC Wrangell Mill is considered an integral part of a MDF facility operation in the analysis.

Two manufacturing capacities were analyzed to evaluate the timber supply required for a MDF facility and are displayed in Table 3-69.

Table 3-69
MDF facility capacity alternatives [1]

	Capacity Alternatives	
	A	B
MDF Capacity (MMSF)	120	65
Roundwood Equivalent (MMBF)	69	37
Sawmill Sawlogs (MMBF)	60	60
Wood Residue (from sawlogs) (MMBF)	23	23
Utility Logs (MMBF)	46	14
Total Roundwood (MMBF)	106	74

[1] MDF capacity is expressed in MMSF. An MMSF is one million square feet of three quarters inch panelboard stock. All other amounts are MMBF

Both capacity alternatives are expected to yield the same stumpage return (approximately $50/MBF) under current market conditions. The economies of scale afforded by the 120 MMSF (see table for definition) design are offset by the high cost of supplementing sawmill residue with whole log chipping. In contrast, over 60 percent of the raw material input for the 65 MMSF plant can be supplied by sawmill residues, which reduces the cost of raw material and offsets the less efficient design.

Because of the high percentage of pulpwood (utility logs) in the timber supply, a 60 MMBF sawlog supply for the sawmill requires a somewhat higher harvest volume. Therefore, the wood requirements of the 120 MMSF MDF plan/sawmill combination are more closely aligned with the physical properties of the timber supply. A smaller MDF plant would be more likely to leave the sawmill with an excess of pulp logs.

In the previously cited Feasibility Analysis of Alternative Wood-Based Industries for the City and Borough of Sitka, Alaska opportunities for a sawmill, a custom kiln drying facility, a planner mill, a laminated strand lumber manufacturing facility, shared manufacturing facilities, as well as a medium density fiberboard facility were all assessed. Based on this analysis, several of the alternatives were feasible.

The Forest Service currently has the authority to make ten-year timber sale contracts. The environmental considerations for this type of contract are not qualitatively different than for any other timber sale contract. In other words, as long as the volume for a ten-year timber sale originated on lands determined to be suitable for timber harvest and the volume was part of the scheduled allowable sale quantity, Forest Plan resource objectives could be met. Social impacts would be related to competition between purchasers. Based on this and other assessments, it would take approximately 100 MMBF annually to support a MDF (or probably other facilities interested in a ten-year timber supply). The feasibility of providing this volume is contingent on other demand for timber supply. For example, the KPC long-term contract may result in harvest of up to an annual average of 190 MMBF, and SBA goals provide for about another 100 MMBF scheduled for small operators dependent on Tongass National Forest wood supply, for a total of roughly 290 MMBF per year. If a value-added facility required another 100 MMBF, the minimum schedule would have to be at least 390 MMBF per year for the next ten years. A timber supply less than this average per year may not be capable of supporting existing and new demands.

Refering back to Table 3-63, 390 MMBF is higher than the historic (1980-94) harvest average of 340 MMBF. Only three alternatives (2, 7 and 9) have a NIC I ASQ component meeting or exceeding this amount. Alternatives 6 and 8 could potentially supply an MDF facility, but at considerably less than 100 MMBF per year.

Tentative Ten Year Timber Sale Action Plan

Preparing a reliable sale program is challenging because of factors beyond the Forest's immediate control. The timber sale planning process for an individual sale, from initial analysis until sale date, takes at least five to six years to complete. Harvest levels in the first few years of the program are tied to current program budget levels and volume currently in the sale pipeline. At any point, varying amounts of Tongass National Forest timber are in different stages of sale preparation. Each stage requires specific activities to be completed by the Forest Service before the timber is available for timber harvest. As a set of activities is completed, the associated timber volume is said to have passed through a "gate" The set of gates numbered one (position statement development) through six (sale award) is referred to as the timber "pipeline" and represents the linkage between the standing inventory and the supply of timber available for harvest. From start to finish, a total of 6 to 10 years may be needed to move a timber sale through the pipeline.

Therefore, the first two or three years of a ten-year program for any alternative respond largely to projected budget levels and work currently prepared; it will take some time to incorporate the additional requirements in the Forest-wide Standard and Guidelines. Consequently, there is little opportunity to add additional sales during the first few years of Revised Forest Plan implementation. The following schedules display how the timber outputs, as provided by each alternative in the Revised Supplement, are likely to be provided during the next few years. Tables 3-72 to 3-77 below display the first three years (1997 - 1999) of the proposed timber sale program for each alternative, except Alternative 1, which has no scheduled sales. Individual sale information is presented by Administrative Area and fiscal year; the long-term contract offerings are identified with an asterisk.

Sale volumes are estimates in most cases, and exact volumes would not be known until measured during project implementation. The actual quantity of timber offered is dependent on annual appropriations and other factors. In the past, appeals and court injunctions have further delayed access to timber sale volume.

The sale schedules are based on current conditions and information available at this time. This is a partial listing because not all projects have been specifically identified. Specific details of exact sale areas and volumes to be harvested are not known for sales in the remaining years of the ten-year period (i.e., 2000 - 2006). This information would be incorporated into the Revised Forest Plan as the timber sale program is updated and revised. As the schedule progresses, more intensive field investigation will result in a refinement of the sale schedule. Periodic changes to the schedule and estimated sale information will be necessary as more site-specific information becomes available. Individual proposals may be revised, deleted, or added as necessary to accomplish the goals of the Forest Plan. The degree of the modification will determine whether or not the Forest Plan needs amendment.

Table 3-70 is an overall summary of all nine alternative Timber Sale Action Plans. The table displays the average annual volume for the first three years. Alternative 2, 7 and 9 volumes are those contained in the current "pipeline." The table also displays the remaining volume that would need to be scheduled during 2000 - 2006 to attain each alternative's ASQ NIC I volume. For Alternatives 3 - 6 and 8, the current 97-99 Timber Sale Action Plan volume was adjusted to account for the proposed alternative resource constraints. The reductions vary by alternative and would be primarily due to old-growth forest reserves, extended timber harvest rotations, additional riparian habitat protection, two-aged silvicultural systems, and harvest threshold standards applied at the watershed (VCU) level. Table 3-71 displays these major resource constraints by alternative.

Table 3-70
Alternative Timber Sale Action Plan Volumes (ASQ NIC I), Average Annual for Fiscal Years 1997 - 1999 in million board feet

Alt.	ASQ NIC I	Long-Term Contract Vol. (97-99)	Independent Volume (97-99)	Total Sale Schedule (97-99)	Remaining Volume (00-06)
1	0	0	0	0	0
2	406	193	115	308	448
3	232	126	59[1]	185	252
4	121	56	28[1]	84	137
5	114	47	23[1]	70	133
6	300	108	70[1]	178	353
7	577	193	115	308	692
8	305	108	77[1]	185	356
9	474	193	115	308	545

[1] Volume may be redistributed to meet long-term contract obligations.

Table 3-71
Resource constraints affecting the ability of the alternatives to provide a timber supply[1]

Alt	OG Reserves	2-Aged Silviculture	VCU Harvest Thresholds	Riparian Habitat	Extended Rotations	Reduction (%)
2						0%
3	X	X		X		40%
4		X	X	X	X	73%
5	X	X	X	X	X	77%
6	X	X	X	X		42%
7						0%
8	X	X		X		40%
9						0%

[1] Alternative 1 has no scheduled timber harvest and is not included.

Table 3-72
Alternatives 2, 7, and 9 Timber Sale Action Plan (1997-1999)

Area	Sale Name/ Landscape Area	Proposed Volume (total) (MMBF)	Location (VCU's)
Fiscal Year 1997			
Chatham	Neka 2*	15.0	193-198; 200-202
	Saook Bay II	8.0	294
	Rodman	21.0	291-293
	Fish Bay	10.0	287
	Indian River	15.0	220-221
Stikine	Rowan II	22.0	416; 417
	South Lindenburg	22.0	437
	King George II	2.0	462
	Small Sales	3.0	Area Wide
Ketchikan	Carroll*	20.0	744
	Control Lake #1*	30.0	552; 553; 574-577
	Control Lake #2*	30.0	552; 553; 574-577
	East Twelve Mile*	35.0	619-621
	Heceta Sawfly	12.0	558-559; 561-563; 570
	Lab Bay 1*	20.0	527-534
	Lab Bay 2*	20.0	535-540; 549-550
	Sentenial Island	6.841	618
	Misc Small Sales	6.8	Area Wide
Total		**298.6**	
Fiscal Year 1998			
Chatham	Port Houghton 1*	30.0	79-89
	Ushk Bay 1	20.0	280-281
	Nakwasina	3.0	299-301
Stikine	Lindy	30.0	437
	Fanshaw	40.0	87-89
	Canal/Hoya*	20.0	520-521
	King George III	2.0	462
	Small Sales	3.0	Area Wide
Ketchikan	Bluff Lake*	20.0	737
	Control Lake 3*	30.0	552-553; 573-577; 596; 591.1; 597.2
	Control Lake 4*	20.0	552-553; 573-577
	Control Lake Misc.	5.0	552-553; 573-577; 596; 597.1; 597.2
	Teal*	14.6	622
	Twelve Mile South*	9.1	621; 624
Total:		**246.7**	
Fiscal Year 1999			
Chatham	Port Houghton 2*	16.0	79-89
	Port Houghton 3*	16.0	79-89
	Neka #3*	20.0	193-198; 200-202
	Whitestone N/S	30.0	205; 207-211
	Schulze	12.0	287-292; 299-302
	Noxon	3.0	287-292; 299-302
	Indian/Ten Mile	10.0	220-222
	False Island	8.0	243-245
Stikine	South Zarembo*	11.0	459
	Nesbitt Reef*	11.0	458
	Kaukan	11.0	525
	East Kuiu*	60.0	416-418
	Muddy	11.0	487; 489
	Small Sales	5.0	Area Wide
Ketchikan	Chasina #1*	20.0	677-681
	Chasina #2*	20.0	677-681
	Control Lake #5*	20.0	591-595
	Control Lake Indep.	5.0	591-595
	Misc. Small Sales	4.33	
	Ratz #1*	10.0	572; 579-585
	Sea Level*	20.0	746; 753; 755-757; 759
	Tuxekan #1*	15.0	554.2; 556; 557; 560; 571; 587-590
	Vixen Inlet*	40.0	708-710; 718; 720; 721
Total:		**378.3**	

*Sale offerings included in the KPC long-term timber sale contract.

Table 3-73
Alternative 3 Timber Sale Action Plan (1997-1999)

Area	Sale Name/ Landscape Area	Proposed Volume (total) (MMBF)	Location (VCU's)
Fiscal Year 1997			
Chatham	Neka 2*	13.0	193-194; 196; 200-201
	Saook Bay II	8.0	294
	Rodman	21.0	291-293
Stikine	Rowan II	22.0	416;
	King George II	2.0	462
	Small Sales	3.0	Area Wide
Ketchikan	Carroll*	20.0	744
	Control Lake #1*	19.0	552; 574-576
	East Twelve Mile*	33.0	619-621
	Heceta Sawfly	12.0	558-559; 561-562; 570
	Lab Bay 1*	8.0	527-534
	Lab Bay 2*	7.0	535-537.1; 540
	Sentenial Island	3.0	618
	Misc Small Sales	6.8	Area Wide
	Total:	**177.8**	
Fiscal Year 1998			
Chatham	Port Houghton 1*	30.0	79-89
	Ushk Bay 1	20.0	280-281
Stikine	Fanshaw	4.0	89
	Canal/Hoya*	6.0	520
	King George III	2.0	462
	Small Sales	3.0	Area Wide
Ketchikan	Bluff Lake*	6.0	737
	Control Lake 3*	30.0	552-553; 573-577; 596; 597.1; 597.2
	Control Lake 4*	19.0	552; 573-576
	Control Lake Misc.	5.0	552-553; 573-577; 596; 597.1; 597.2
	Teal*	14.6	622
	Twelve Mile South*	6.0	621; 624
	Total:	**145.6**	
Fiscal Year 1999			
Chatham	Port Houghton 2*	16.0	79-89
	Port Houghton 3*	16.0	79-89
	Whitestone N/S	15.0	205; 207; 209-210
	Schulze	12.0	287-289; 291-292
	Noxon	3.0	287-289; 291-292
	Indian/Ten Mile	4.0	222
	False Island	8.0	243-245
Stikine	South Zarembo*	11.0	459
	Nesbitt Reef*	8.0	458
	East Kuiu*	26.0	416
	Muddy	11.0	487
	Small Sales	5.0	Area Wide
Ketchikan	Chasina #1*	15.0	678-681
	Control Lake #5*	20.0	591-595
	Control Lake Indep.	5.0	591-595
	Misc. Small Sales	4.33	
	Ratz #1*	10.0	580; 583-585
	Sea Level*	20.0	746; 753; 755-757; 759
	Tuxekan #1*	14.0	554.2; 556; 560; 571; 589; 590
	Vixen Inlet*	8.0	709; 720-721
	Total:	**231.3**	

*Sale offerings included in the KPC long-term timber sale contract. Other volume may be redistributed to meet long-term contract obligations.

Table 3-74
Alternative 4 Timber Sale Action Plan (1997-1999)

Area	Sale Name/ Landscape Area	Proposed Volume (total) (MMBF)	Location (VCU's)
Fiscal Year 1997			
Chatham	Neka 2*	15.0	193; 200-201
	Saook Bay II	8.0	294
	Indian River	5.0	220
Stikine	King George II	2.0	462
	Small Sales	3.0	Area Wide
Ketchikan	Carroll*	3.0	744
	Heceta Sawfly	4.0	563
	Sentenial Island	6.0	618
	Misc Small Sales	6.8	Area Wide
	Total:	**52.8**	
Fiscal Year 1998			
Chatham	Port Houghton 1*	30.0	79; 81-83
	Ushk Bay 1	8.0	281
Stikine	Fanshaw	11.0	87
	King George III	2.0	462
	Small Sales	3.0	Area Wide
Ketchikan	Control Lake 3*	9.0	596
	Total:	**63.0**	
Fiscal Year 1999			
Chatham	Port Houghton 2*	16.0	79; 81-83
	Port Houghton 3*	16.0	79; 81-83
	Neka #3*	5.0	200
	Whitestone N/S	8.0	205; 208
	Indian/Ten Mile	5.0	220
Stikine	Small Sales	5.0	Area Wide
Ketchikan	Chasina #1*	16.0	678-681
	Control Lake #5*	20.0	592-594
	Control Lake Indep.	5.0	592-594
	Misc. Small Sales	4.33	
	Sea Level*	16.0	755.2; 757; 759
	Vixen Inlet*	21.0	708; 709; 720
	Total:	**137.3**	

*Sale offerings included in the KPC long-term timber sale contract. Other volume may be redistributed to meet long-term contract obligations.

Table 3-75
Alternative 5 Timber Sale Action Plan (1997-1999)

Area	Sale Name/ Landscape Area	Proposed Volume (total) (MMBF)	Location (VCU's)
Fiscal Year 1997			
Chatham	Neka 2*	15.0	193; 200-201
	Saook Bay II	8.0	294
	Fish Bay	6.0	287
Stikine	King George II	2.0	462
	Small Sales	3.0	Area Wide
Ketchikan	Carroll*	3.0	744
	Heceta Sawfly	4.0	563
	Sentenial Island	4.0	618
	Misc Small Sales	6.8	Area Wide
	Total:	**51.8**	
Fiscal Year 1998			
Chatham	Port Houghton 1*	30.0	79; 82; 84; 86
Stikine	Fanshaw	7.0	87
	King George III	2.0	462
	Small Sales	3.0	Area Wide
Ketchikan	Control Lake 3*	4.0	596
	Total:	**46.0**	
Fiscal Year 1999			
Chatham	Port Houghton 2*	16.0	79; 82; 84; 86
	Port Houghton 3*	16.0	79; 82; 84; 86
	Whitestone N/S	9.0	208
	Schulze	6.0	287
Stikine	Small Sales	5.0	Area Wide
Ketchikan	Chasina #1*	16.0	678-681
	Control Lake #5*	19.0	592; 594
	Misc. Small Sales	4.33	
	Sea Level*	15.0	755.2; 757; 759
	Vixen Inlet*	6.0	709
	Total:	**112.3**	

*Sale offerings included in the KPC long-term timber sale contract. Other volume may be redistributed to meet long-term contract obligations.

Table 3-76
Alternative 6 Timber Sale Action Plan (1997-1999)

Area	Sale Name/ Landscape Area	Proposed Volume (total) (MMBF)	Location (VCU's)
Fiscal Year 1997			
Chatham	Neka 2*	15.0	193-198; 200-201
	Saook Bay II	8.0	294
	Fish Bay	10.0	287
	Indian River	5.0	220
Stikine	Rowan II	22.0	416; 417
	King George II	2.0	462
	Small Sales	3.0	Area Wide
Ketchikan	Carroll*	20.0	744
	Control Lake #1*	25.0	575-576
	Heceta Sawfly	8.0	563
	Lab Bay 2*	3.0	549
	Sentenial Island	6.841	618
	Misc Small Sales	6.8	Area Wide
	Total:	**134.6**	
Fiscal Year 1998			
Chatham	Port Houghton 1*	30.0	79-89
	Ushk Bay 1	20.0	280-281
Stikine	Fanshaw	28.0	87; 89
	Canal/Hoya*	19.0	520-521
	King George III	2.0	462
	Small Sales	3.0	Area Wide
Ketchikan	Control Lake 3*	3.0	575; 596
	Control Lake 4*	11.0	576
	Total:	**116.0**	
Fiscal Year 1999			
Chatham	Port Houghton 2*	16.0	79-84; 86-89
	Port Houghton 3*	16.0	79-84; 86-89
	Neka #3*	20.0	193-198; 200-202
	Whitestone N/S	20.0	208
	Schulze	12.0	287-290
	Noxon	3.0	287-290
	Indian/Ten Mile	5.0	220
Stikine	Kaukan	11.0	525
	East Kuiu*	60.0	416-418
	Small Sales	5.0	Area Wide
Ketchikan	Chasina #1*	20.0	678-681
	Chasina #2*	5.0	678-681
	Control Lake #5*	20.0	594
	Control Lake Indep.	5.0	594
	Misc. Small Sales	4.33	
	Sea Level*	20.0	755.2; 757; 759
	Vixen Inlet*	40.0	708-710; 718; 720; 721
	Total:	**282.3**	

*Sale offerings included in the KPC long-term timber sale contract. Other volume may be redistributed to meet long-term contract obligations.

Table 3-77
Alternative 8 Timber Sale Action Plan (1997-1999)

Area	Sale Name/ Landscape Area	Proposed Volume (total) MMBF	Location (VCU's)
Fiscal Year 1997			
Chatham	Neka 2*	9.0	200-202
	Saook Bay II	8.0	294
	Rodman	21.0	291-293
	Fish Bay	10.0	287
	Indian River	15.0	220-221
Stikine	Rowan II	3.0	416
	King George II	2.0	462
	Small Sales	3.0	Area Wide
Ketchikan	Carroll*	19.0	744
	Control Lake #1*	27.0	552; 574-577
	East Twelve Mile*	30.0	619-621
	Heceta Sawfly	12.0	558-562
	Lab Bay 1*	13.0	527; 529; 532; 534
	Lab Bay 2*	7.0	535-537; 540
	Sentenial Island	4.0	618
	Misc Small Sales	6.8	Area Wide
	Total:	**189.8**	
Fiscal Year 1998			
Chatham	Port Houghton 1*	30.0	79-89
	Ushk Bay 1	20.0	280-281
	Nakwasina	2.0	299
Stikine	Fanshaw	12.0	89
	King George III	2.0	462
	Small Sales	3.0	Area Wide
Ketchikan	Bluff Lake*	5.0	737
	Control Lake 3*	30.0	552; 573-577; 596; 591.1; 597.2
	Control Lake 4*	20.0	552; 573-577
	Control Lake Misc.	5.0	552; 573-577; 596; 597.1; 597.2
	Teal*	14.6	622
	Twelve Mile South*	2.0	621; 624
	Total:	**145.6**	
Fiscal Year 1999			
Chatham	Port Houghton 2*	16.0	79-85; 87-89
	Port Houghton 3*	16.0	79-85; 87-89
	Whitestone N/S	29.0	205; 207; 209-211
	Schulze	12.0	287-289; 291-292; 299
	Noxon	3.0	287-289; 291-292; 299
	False Island	8.0	243-245
Stikine	South Zarembo*	11.0	459
	Nesbitt Reef*	9.0	458
	East Kuiu*	3.0	416
	Muddy	11.0	487
	Small Sales	5.0	Area Wide
Ketchikan	Chasina #1*	17.0	677-681
	Control Lake #5*	20.0	591-595
	Control Lake Indep.	5.0	591-595
	Misc. Small Sales	4.33	
	Ratz #1*	10.0	572; 579-581; 583
	Sea Level*	20.0	746; 753; 755-757; 759
	Tuxekan #1*	15.0	554.2; 556; 557; 560; 571; 587-590
	Vixen Inlet*	7.0	720; 721
	Total:	**221.3**	

*Sale offerings included in the KPC long-term timber sale contract. Other volume may be redistributed to meet long-term contract obligations.

Projected Demand

Section 101 of the Tongass Timber Reform Act states, in part:

> "the Secretary shall, to the extent consistent with providing for the multiple-use and sustained yield of all renewable resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle."

Alternative Comparisons

To establish expectations about demand over the planning cycle, this analysis relys principally on market studies by Forest Service economists (Brooks and Haynes, 1994). Table 3-78 displays the projected volume (i.e., raw material requirements) of National Forest timber necessary to support the projected consumption of Alaska products (i.e., lumber, pulp, and export logs), given harvest from other sources in Alaska. The average annual lumber demand (1996-2005) is projected to be about 242 MMBF and pulp about 180 thousand short tons.

Brooks and Haynes concluded that:

- Expected increases in lumber production, with associated residues suitable for use in pulp production, shift the derived demand for National Forest timber from pulp logs to saw logs.
- The demand for sawlogs from the National Forest is projected to increase by 28 percent, while the demand for pulp logs is expected to decrease by 37 percent.
- The Tongass inventory was not evaluated on whether it is capable of supporting such a shift in the pattern of use.

Table 3-78
Raw Material Requirements Needed to support projected consumption of Alaska Products

Year	Sawlogs (MMBF)	Export logs [1] (MMBF)	Pulp logs [2] (MMBF)	Total (MMBF)	Sawlog (%)
1996	170.7	42.7	76.8	290.2	59
1997	178.7	44.7	80.1	303.4	59
1998	197.4	39.5	76.8	312.9	63
1999	198.5	39.7	70.6	308.8	64
2000	187.8	37.6	72.7	298.1	63
2001	215.9	43.2	67.0	326.1	66
2002	220.2	44.0	66.1	330.4	67
2003	247.3	49.5	55.4	352.2	70
2004	223.4	44.7	60.3	328.4	68
2005	219.1	43.8	61.2	324.1	68
Total:	2059.0	429.4	687.0	3,174.6	65

(1) Export logs: Usually consist of cedar
(2) Pulp logs: Utility logs and low grade sawlogs that historically have gone to the pulp mill.

Species composition and log quality were evaluated for each alternative (refer to previous sections on species composition and expected product outputs from each alternative) on whether the alternative would be capable of producing the raw material requirements necessary to support the projected Alaska consumption of lumber, pulp and export logs (usually cedar). Given Alaska's competitive position and high cost structure, the assumption is that the higher quality and higher value sawlogs would be converted to lumber or other sawn products and the lower quality sawlogs plus utility logs would be converted to pulp. Historically, it is reported that about 55 to 60 percent of the Tongass timber gets delivered to the sawmill; however, a portion of this material gets chipped at the sawmill. The material delivered to the saw mill is primarily the higher value, higher grade logs. We do not expect this relationship to change over the next 10 years, but as timber harvesting moves to higher elevations, volume per acre and quality is expected to decrease.

Sawlogs. The projected annual average sawlog requirement (1996-2005) necessary to produce about 242 MMBF of lumber is about 206 MMBF of sawlog quality material (due to over run). As displayed in Table 3-79, the ASQ NIC I component of Alternatives 7 and 9 would be capable of meeting this demand. Alternative 2, with the addition of its NIC II component, would also be capable of supplying this demand. Alternatives 1, 3, 4, 5, 6, and 8 would not be capable of providing a sufficient quantity of sawlogs of a quality that is normally used in meeting projected sawlog demand.

Table 3-79
Alternative Sawlog composition in relation to projected demand for Tongass sawlogs [1]

Alt.	Sawtimber Projection (10 yr average) [2]	ASQ NIC I	Private/Other[2]	Total Supply	Surplus or Deficit
1	206	0	0	0	-206
2	206	183	0	183	-23
3	206	106	0	106	-100
4	206	57	0	57	-149
5	206	53	0	53	-153
6	206	139	0	139	-67
7	206	259	0	259	53
8	206	137	0	137	-69
9	206	219	0	219	13

(1) MMBF
(2) From Brooks and Haynes

Pulp Logs. The projected annual average raw material requirement (1996-2005) necessary to produce about 180,000 short tons of pulp is about 345 bone dry units (BDUs). This material would consist of utility logs, low grade sawlogs and sawmill by-product. Alternatives 2, 3, 6, 7 , 8 and 9 (ASQ NIC I component) would be capable of providing sufficient raw material to met this demand (see Table 3-80). There is a surplus of chip by-product in Alternatives 6 through 9, which could be exported or utilized in another type of facility that would use wood residue. Alternatives 1, 4, and 5 would not be capable of meeting the raw material requirements for projected pulp demand. However, by chipping all the high value, high grade logs, Alternatives 4 and 5 may be able to satisfy the raw material requirements for pulp. Alternative 1 has no scheduled yield.

Table 3-80
Alternative Pulp log composition plus chip by-product in relation to projected demand for Tongass.

Alt.	Pulp Projection (10 yr average) (2)	Tongass (BDU) (1)	Private/ Other (BDU)	Total Supply	Surplus or Deficit
1	345	0	24	24	-
2	345	569	24	593	248
3	345	327	24	351	6
4	345	176	24	200	-145
5	345	162	24	186	-159
6	345	430	24	454	109
7	345	806	24	830	485
8	345	425	24	449	104
9	345	680	24	704	359

BDU = Bone Dry Units
(1) From Table 3-62
(2) From Brooks and Haynes

Summary: Given the assumptions on the standing inventory species composition and quality, Alternatives 7 and 9 would have the capability of providing sufficient raw material that would meet projected demand for lumber and pulp. Alternatives 2, 3, 6 and 8 would have the capability of providing sufficient raw material to meet projected demand for pulp, but they would not provide sufficient sawlog volume to meet projected lumber demand. Alternatives 1, 4 and 5 would probably not provide sufficient raw material to meet either projected pulp or lumber demands.

Proportionality

Tongass Timber Reform Act Section 301(c)(2) provides that:

> The [long-term timber sale] contracts are hereby modified to:
> ... (2) eliminate the practice of harvesting a disproportionate amount of old-growth timber by limiting the volume harvested over the rotation in volume classes 6 and 7, as defined in TLMP and supporting documents, so that the proportion of volume harvested in these classes within a contiguous management area does not exceed the proportion of volume currently represented by these classes within the management area.

The 1991 SDEIS used the proportion of volume class 6 and 7 acres within each management area allocated for timber harvest to constrain the rate of harvest for the two long-term timber sale contracts. While the total amount of suitable acres were not changed by these constraints, the proportion of volume class 6 and 7 acres (compared to the total old-growth timber base) was held constant for each management area in the Ketchikan Pulp Company sale area for the first decade (scheduled contract expiration in 2004) and for the first two decades in the Alaska Pulp Corporation primary sale area (scheduled contract expiration in 2011 although terminated in 1994). This is the same implementation procedures used in the current Forest Service Handbook 2409.18-93-3 (August 15, 1993). These procedures specify that the Timber Type Map (referred to as TIMTYP in the Forest computer mapping Geographic Information System) will be used as the source of timber volume class information for determining proportionality.

The Forest Service Handbook implementation procedures were challenged by the Wildlife Society (Wildlife Society v. Barton) on the first long term contract timber offering ROD completed after TTRA enactment. The Wildlife Society and other plaintiffs brought suit challenging the method used to calculate proportionality based on the use of acres instead of volume and asserted that the TIMTYP maps were too inaccurate to use in determining volume class proportions. In the April 11, 1994 decision, the federal district court granted plaintiffs' request for a declaration that the decision to offer timber under the current instruction was arbitrary and capricious within the meaning of the Administrative Procedures Act because of reliance on the type maps and use of acres instead of volume to determine timber volume class proportions. The court remanded the case to the Forest Service to devise a more accurate means of calculating timber volume based proportionality for the purpose of TTRA, or alternatively to adequately express its reasons for rejecting the methods proposed by plaintiffs.

Since the court decision, the Forest Service has been consulting with plaintiffs and timber industry representatives and working to develop an improved methodology for implementing the TTRA proportional harvest requirement. Resulting draft changes to the FSH remain under review.

Unlike the 1991 Draft Supplement, this Supplement does not provide for specific constraints to directly calculate TTRA Proportionality. TTRA Proportionality is an implementation requirement for the KPC long-term contract and is beyond the scope of the Forest Plan. To insure that implementation can take place, the yield calculations for each alternative were based on scheduling the high, medium and low old-growth volume classes evenly over the planning horizon (see Figure 3-5). While this does not meet a strict interpretation of scheduling the volume harvested from volume classes 6 and 7 proportional to the high volume within each contiguous TLMP management area, it does provide enough flexibility in the amount of high and low volume scheduled to implement the TTRA proportional harvest requirement in any management area where KPC long-term contract harvest may occur.

Figure 3-5
Acres of Old Growth Volume Class and Young Growth Scheduled by Alternative

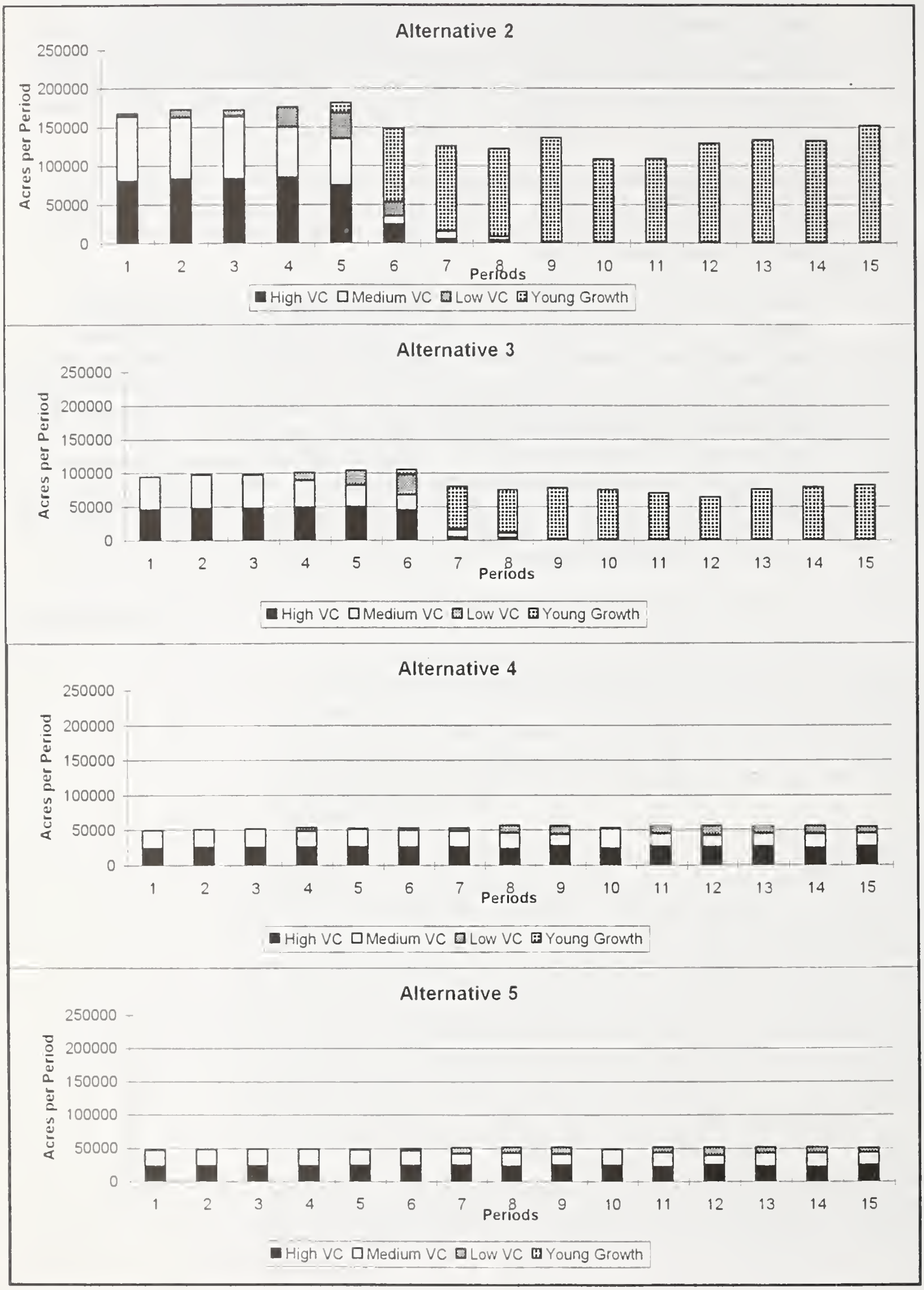
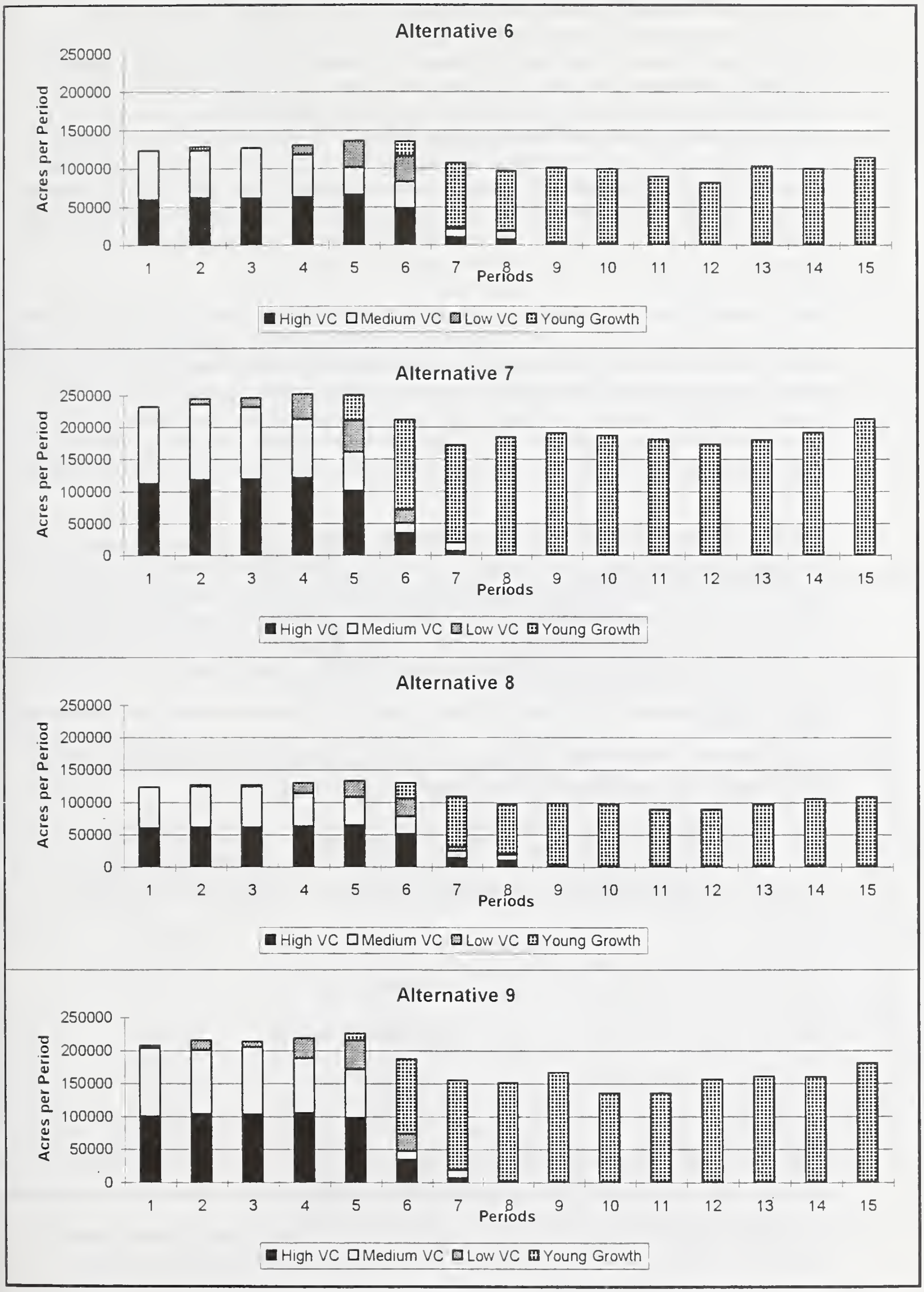


Figure 3-5
Acres of Old Growth Volume Class and Young Growth Scheduled by Alternative



Future Conditions

Most of the existing timber stands (about 92 percent) on the Tongass are beyond culmination of mean annual increment (CMAI). Timber stands which exceed CMAI are not growing at optimal rates for their site's potential productivity. Tongass timber stands are capable of producing prodigious amounts of wood. On a site typical of those currently harvested (Taylor Site Index 120, Yield of Second-Growth Western Hemlock-Sitka Spruce Stands in Southeastern Alaska), a normally stocked stand 30 years old would be expected to contain 197 square feet of basal area and 3,800 cubic feet of wood per acre. By age 50, basal area will increase to 248 square feet and volume to 7,275 cubic feet. The age of merchantable CMAI would be around 100 years with a mean annual increment of 137 cubic feet/acre/year. The yield per acre in board feet (International rule (1/8-inch kerf)) would be about 91 MBF (7 inch and more in diameter at breast height). Yields from two-aged silvicultural systems would be significantly less (Alternatives 3, 4, 5 , 6 and 8) but still significantly higher than existing old-growth stands.

As a greater proportion of the forest is converted from slower growing, highly-defective stands to stands well-stocked with vigorously growing conifers, total forest growth would increase. Because of higher volumes and lower defect, managed young-growth would be able to provide significantly higher harvests on the same land base or support the same harvest on a smaller land base. Under a 100-year rotation only about 2/3 of the current timber base would be needed to provide the ASQ. The remaining 1/3 of the timber base could revert to some other land use and be available to provide old-growth habitat.

Since each alternative would prescribe different harvesting schedules and timber management land bases, the conversion period (the time it takes to reach a regulated stand) would vary considerably between alternatives. Table 3-81 displays for each alternative the conversion period for existing stands and the average rotation age or management age of the managed stands. There is a wide variey of rotation ages (70 to 160 years) in all alternatives, with the exception of Alternatives 4 and 5.

Table 3-81
Old Growth Conversion Periods and Young-Growth Rotation Ages and Management Ages (Regulation Class 1 and 2 lands) (1)

Alt	Conversion Period Existing Stands	Average Rotation Age Young-Growth/ Management Age	Young-Growth RotationManagement Age Range in Values
1	-	-	-
2	80	95	70-160
3	90	105(2)	70-160
4	150+	200(2)	
5	150+	200(2)	
6	140	100(2)	70-160
7	70	90	70-160
8	150+	100(2)	70-160
9	80	95	70-160

(1) Years
(2) Rotation age for two-aged management is based on the managed understory. These stands contain significant amounts of unmanaged old-growth structure in the overstory.

To achieve maximum site productivity, regeneration of these slower growing stands is needed. In all alternatives, harvesting of mature, old-growth stands would occur.

Because only a portion of the Forest would emphasize timber management, most of the existing mature and old-growth stands on the Forest would be maintained. Various amounts of old-growth conifer stands are maintained or allowed to develop in each alternative. Alternatives which allocate the most acres to development-oriented land allocations will gradually have stands in younger timber age classes, and fewer stands of old-growth. However, at the end of the planning horizon (160+ years from now) the predominant age class on the Tongass will still be greater than 150 years. The percent of total timber lands that would be managed stands of less than 160 years of age is expected to be a relatively small component of the forest landscape on a Forest-wide basis for all alternatives. Old-growth will still be the predominant vegetative structure on the Tongass. The age class distributions and vegetative structures that would be present 160 years from now are displayed in Table 3-82 and Table 3-83.

The distributions take into account harvest that is projected to not occur because of project implementation factors and economic factors. Because of the two-aged silvicultural methods, Alternatives 3, 4, 5, 6 and 8 would contain signifcant old-growth structure within the harvest units. In 160 years, the proportion of the productive forest occupied by managed timber stands (stands less than 160 years old) would range from approximately 0 percent in Alternative 1 (this alternative has no scheduled timber harvest) to 24 percent in Alternative 7. Alternative 7 has the greatest allocation of acres to timber management. Conversely, the amount of total productive forest in an "old-growth" condition or trending towards old-growth would range from almost 100 percent in Alternative 1 to 76 percent in Alternative 7.

Table 3-82
Age class distribution (thousands of acres) at the end of the planning horizon (160 years), Timberlands

Age Class	Alt 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
10	113.1	66.2	34.5	33.4	77.1	161.7	86.5	137.6
20	113.5	63.1	38.4	38.9	85.4	150.3	81.6	138.9
30	103.4	53.1	42.0	38.8	67.2	142.0	74.4	133.0
40	90.0	57.7	42.2	40.7	73.8	151.8	73.8	115.4
50	89.4	62.4	43.9	40.1	82.7	157.3	82.1	115.4
60	113.4	64.8	46.5	41.9	84.5	160.9	82.6	142.9
70	84.1	63.0	48.2	42.9	80.8	116.3	81.4	101.7
80	49.0	60.4	45.4	42.1	83.2	52.0	78.0	69.0
90	63.3	68.9	45.3	40.9	86.4	56.7	78.0	95.4
100	85.3	64.1	45.1	40.6	83.8	93.6	79.2	110.7
110	60.3	25.3	45.8	40.2	31.1	63.6	34.4	75.0
120	18.3	15.1	44.3	40.2	18.0	14.5	18.0	18.0
130	29.7	12.4	43.5	39.9	11.7	20.6	11.2	19.3
140	16.0	4.7	42.2	38.8	7.2	6.4	4.8	13.2
160		89.3	325.1	307.2	61.2	23.8	59.6	26.1
Suitable Young Growth	1,060	771	932	866	934	1,372	926	1,312
Suitable Old Growth(1)	464.3	414.9	571.2	530.4	462.8	669.6	460.8	554.7
Total Suitable	1,524	1,185	1,504	1,397	1,397	2,041	1,386	1,866.
Unsuitable Timberland	4,201	4,539	4,221	4,328	4,328	3,683	4,338	3,858.
Other Forest Land(2)	4,249	4,249	4,249	4,249	4,249	4,249	4,249	4,249
Total Forest	9,974	9,974	9,974	9,974	9,974	9,974	9,974	9,974

(1) Suitable Old Growth: Available for harvest but not harvested because of model implementation reduction factors and poor economics (primarily NIC II land).
(2) Other Forest Land: low productive old-growth forests (i.e., muskeg)

Table 3-83
Forest wide stand structures at the end of the planning horizon (160 Years), Timberlands

Stand Structure	Alt 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Stand Initiation (0 - 20 Years)	227	129	73	72	163	312	168	277
Stem Exclusion (30-120 years)	757	535	449	408	691	1009	682	977
UnderStory Reinitiation (130-160 years)	76	106	411	386	80	51	76	59
Old-growth	464	415	571	530	463	670	461	555
Total Suitable	1,524	1,185	1,504	1,397	1,397	2,041	1,386	1,866
Unsuitable Old Growth Timberland	4,201	4,540	4,221	4,328	4,328	3,684	4,339	3,859
Stand Initiation	4%	2%	1%	1%	3%	5%	3%	5%
Stem Exclusion	13%	9%	8%	7%	12%	18%	12%	17%
Understory Reinitation	1%	2%	7%	7%	1%	1%	1%	1%
Old Growth	81%	87%	84%	85%	84%	76%	84%	77%

Conifer growth in young stands can be accelerated through silvicultural treatments which control conifer stocking, reduce competing vegetation and reduce the threat from pests and diseases. Benefits from such treatments may include larger piece size and consequently cheaper logging costs , increased stand variability, higher quality wood (particularly in spruce, if pruned), and employment opportunities. In addition, treatments may shorten the time period spent in the stem exclusion phase of stand development and offer other resource benefits. Carey and others (1995) concluded, on the basis of published reports, that young-growth forests actively managed for biodiversity could support virtually all the species occurring in western Washington. Carey (1994) has proposed a biodiversity pathway for forest management based on comparisons of biotic communities in old-growth, young natural, and managed forests. This is based on (1) conservation of biological legacies during harvest and regeneration, (2) minimizing time in the stem exclusion stage of stand development, (3) ensuring diversity and niche diversification in later stages through thinnings and coarse woody debris management (logs and cavity trees), and (4) using extended rotations on a significant part of the land base.

Enhancing wildlife and fish habitat carrying capacity in young-growth forests is an objective of the Tongass National Forest. To meet this objective, a young-growth management program was started in 1982 to develop and demonstrate silvicultural treatments for young-growth stands. The Forest has been developing some experience in precommercial thinning but commercial thinnings have yet to be thoroughly explored. Other information needs are : (1) given Alaska's competitive position in the world market, what kind of young-growth should be produced on the Tongass--should the Forest maximize fiber production, sawlog production, wood quality or a combination; (2) what would be the quality of young growth produced under different management scenarios; (3) would pruning be cost effective; (4) would fluting be a problem in the young-growth stands; and (4) what are the windthrow and stand damage affects from commercial thinning?

Mitigation of Impacts on Timber Supply

A range of activities can be used to avoid, minimize, or compensate for adverse effects on timber quantity and quality. The types of mitigation measures will not vary by alternative, but the degree to which they are applied will depend on the rate and location of timber harvest activities.

The effects of other resource activities on timber, especially on the allowable sale quantity, can often be mitigated through intensity of timber management activities on lands scheduled for harvest. The degree to which these mitigation measures are applied is closely related to the amount and location of land available to be considered for timber management activities. The effects of other resource activities within areas available for timber harvest consideration have the potential of lowering the amount of timber actually offered for sale and thus affecting the established timber industry.

Reductions in timber yield can be mitigated in a number of ways: costs, returns on investments, developing new industries, and yields from second-growth stands. Each of these has the potential to play significant roles in timber supply for the future.

Costs. Areas categorized in the ASQ NIC II component have very high anticipated road access and or logging systems costs associated with them. About one quarter of the suitable-available landbase in each alternative is classified as “difficult” or “isolated”. Improvements in technology that would enable the harvesting of these stands in a cost-efficient manner are needed. In addition, technological advances that reduce manufacturing costs, transportation costs, and harvest costs would expand the “economic” landbase of the Tongass.

Returns on Investments. Timber yields from the Tongass are expected to increase substantially from the conversion of old-growth to second-growth. Previously harvested areas have roads in place and many have had precommercial thinning completed. The investments in these areas need to be protected if yields associated with the future harvest of old-growth as well as second-growth stands can be recaptured in later entries. Loss of these areas to land designations precluding timber harvest will have the potential of significantly impacting predicted timber supply in the future decades. In addition, future investments in precommercial thinning need to be maintained if the allowable sale quantity of the Revised Forest Plan is to be maintained.

Rural Development and Value Added Industries. Cedars, both western redcedar and Alaska yellow-cedar, are not generally used by the industry in Southeast Alaska, but are sold in other markets. The creation of Southeast Alaska industries that could utilize this species would in effect increase the wood supply. The 1990 Farm Bill passed by Congress provides opportunities for rural communities to request assistance from the Forest Service in developing and implementing economic revitalization plans.

There are a number of possibilities and potentials for additional timber-based industries (so called “value added” industries) to create jobs and compensate for any job loss caused by limitations on timber supply. These include:

1. Special forest products such as musical instruments, greenery, mushrooms & berries, and totem pole carving.
2. Value-added products such as air dried finished lumber to be shipped to Puget Sound for kiln drying for use in finger-jointed wood products, wood pellets for stoves, log homes, pre-fab cedar gazebos, door moulding, and cedar shakes.
3. Harvest of sphagnum moss from the muskegs.

4. Electrical generation using modified diesel-fired systems or new wood-gasification systems, including pellet plants, and wood chip cogeneration systems. These systems would use logging slash, wood chips and sawmill waste.

Yields. Higher yields may also come from new technology, allowing commercial thinning in stand types typical to Southeast Alaska. Effectiveness will result if thinning operations can be achieved over long yarding distances with minimal damage to residual timber.

Fertilization of regenerated stands has been tested in some locations of the Tongass (such as Thomas Bay in the Stikine Area). Fertilization of stands on some soil types has increased per-acre yield and shows promise, although the costs associated with application and maintenance are high. Application of this method of increasing timber yields will be dependent on the effects on other resources, costs of application, and returns in timber volume as a result of use.

Transportation

Affected Environment

There are three principal types of travel in Southeast Alaska: air, water, and ground. Historically, marine transportation has been the major method of moving freight and passengers, and during the last three decades air services have developed to serve the growing demand for rapid transportation between communities within Alaska and to the contiguous United States. On National Forest land a roaded transportation system has developed, largely in support of timber harvesting.

Access from Southeast Alaska to the continental road system is currently available at only five points via the Alaska Marine Highway (all are water ports). Three of these connections are to the United States communities of Haines and Skagway, Alaska, and Bellingham, Washington, while the other two connections are to the Canadian communities of Stewart (via Hyder, Alaska) and Prince Rupert, British Columbia. Prince of Wales Island has the only road system in Southeast Alaska that interconnects island communities. Several possibilities exist for State Highways that could connect some communities of Southeast Alaska to the continental road system, and for new internal corridors (Southeast Alaska Transportation Plan, 1986). Some of these are currently under study.

The Alaska Power Authority has proposed corridors for transmission lines and/or undersea cables to link many Southeast Alaska communities to British Columbia. A powerline from Tyee hydropower site along the Bradfield Canal/Craig River road corridor route to Canada is one of the identified corridors for consideration.

Forest development roads ("Forest roads") are constructed to provide access to National Forest lands, and are included in the Forest Development Transporation Plan (see Transporation Forest-wide Standards and Guidelines in Chapter 4 of the Proposed Revised Forest Plan). They are functionally classified as arterial (serving large land areas and usually connecting to public highways), collector (serving smaller areas, usually connecting to arterials or public highways), and local (terminal roads, may connect to any other type). Forest roads are also managed by a system of maintenance levels, depending on their intended use and suitability to various types of vehicles. These range from level 1 (closed) to level 5 (suitable for passenger cars).

Except at a few administrative sites and campgrounds, all Forest roads are single lane, constructed with blasted quarry rock, and designed for off-highway loads. Typical collector and local roads are 14 feet wide, with a rough gravel surface; higher standard arterial roads are normally 16 feet wide, may have a smooth gravel surface, and are designed for speeds of up to 30 miles per hour. Travel speed on lower standard roads is often controlled more by surface roughness than by horizontal alignment or road gradient.

For the Tongass, the demand for roads has primarily been a function of the demand for access to timber resources. The maintenance and reconstruction requirements of the existing system depend mainly on the volume of timber hauled, and to a lesser extent on recreational use. The amount of future construction is anticipated to continue to be largely dependent on the need to access timber resources. Currently the Forest road system includes approximately 4,650 miles of road providing access to about 9 percent of the Tongass National Forest. About one-fourth of these road miles are not managed for car and truck use. Over one-half of the more than 2,000 miles of road open to public motorized vehicle use are connected to communities. Between 1984 and 1993 an average of 168 miles of road was constructed annually.

The transport of harvested timber from isolated islands in Southeast Alaska requires both land and water routes to reach processing facilities. Log transfer facilities are used to transfer logs to and from the water and to put together log bundles for towing. There are a total of 116 log transfer facility sites existing in Southeast Alaska on National Forest lands, and an additional 17 sites which the Forest Service uses or is seeking agreements to use on State or private lands. Log transfer facilities can have adverse effects on the local marine environment.

Except for Wilderness, National Monuments, and Research Natural Areas, the Forest is designated open to off-highway vehicles. In specific locations where conflicts with other uses, public safety problems, or damage to resources could occur, site-specific closures are considered. The goal of off-highway vehicle management is to ensure resource protection and public safety, minimize user conflicts, and provide diverse opportunities for Forest users.

Environmental Consequences

All alternatives except Alternatives 1 and 9 apply the Transportation and Utility Systems LUD to most proposed or potential State highway linkages and transmission corridors mentioned above. (Exceptions are the proposed Petersburg-to-Kake road corridor, and proposals in the vicinity of the Stikine-LeConte Wilderness.) This LUD will minimize potential conflicts, such as over determining the appropriate visual quality objective, should development of any of these occur. A Juneau-to-Haines linkage, and the East Bradfield River corridor, have received the most attention in recent years. (See also the Lands section.)

Table 3-84 displays the anticipated road construction by alternative for the first and fifth decades, expressed both in annual averages and cumulatively. These road miles are directly related to proposed timber harvesting activities.

Table 3-84
Annual and cumulative miles of new road construction by alternative.[1]

	Decade 1		Decade 5	
Alternative	Annual Miles	Cumulative (at end of Decade)	Annual Miles	Cumulalive (at end of Decade)
1	0	4,650	0	4,650
2	179	6,441	116	10,770
3	121	5,862	62	8,101
4	63	5,283	18	6,317
5	60	5,252	17	6,226
6	158	6,227	84	9,195
7	298	7,633	153	13,816
8	159	6,248	85	9,228
9	264	7,293	159	12,856

[1] Includes all roads from the present (4,650 miles) to the end of the decade. Annual miles are rounded to the nearest mile.

Roads have the potential to affect fish habitat, soils, and water quality by increasing erosion and landslide potential, to change recreation settings and opportunities, to alter scenery, and to increase legal and illegal wildlife kills. These types of effects are discussed in the subject resource setion of this chapter.

Based on current practices, about 35 percent of new roads would be closed to motorized traffic once their initial use is over, but may allow non-motorized and foot traffic. Bridges may be removed from these roads, and the roads themselves are likely to revegetate naturally. Another 30 percent would remain open to motorized vehicles, but would be isolated from large road systems or communities, primarily on remote islands. The remainder would be open to motorized vehicles and connected to communities, and would likely be maintained for continuous multiple-use activities.

Each alternative will require reconstruction of a portion of the existing road system in each decade. Reconstruction of a road maintains the original investment, protects forest resources, and makes the road suitable and safe for the intended use. Reconstruction involves the rehabilitation of the original roadbed, and can include cleaning ditches and culverts, replacing damaged drainage structures, re-installing bridges, and grading and shaping.

Log transfer facilities can adversely affect the local marine benthic habitat (plants and animals that live in and on the ocean bottom). The primary effect is from underwater bark accumulation. As discussed in more detail in the 1991 SDEIS, log transfer facilities affect on the average about two acres of marine benthic habitat per site. Using this 2-acre average, about 232 acres of marine benthic habitat associated with the existing 116 log transfer facilities on Forest Service lands are currently experiencing bark accumulations. This is roughly 0.05 percent of the total estuarine area less than 60 feet deep. The greatest effect of bark and debris accumulation is thought to be on little neck clams, bay mussels, and other mollusks.

The 1991 SDEIS projected a need of from 98 to 176 new log transfer facilities over the next 30 years. (Alternative 1 is likely to need much fewer than 98, but the other alternatives are likely to fall within this range.) This represents another 200 to 350 acres of marine benthic habitat adversely affected (roughly another 0.04 to 0.08 percent of estuarine habitat under 60 feet deep).

Mitigation

The Alaska Regional Guide, and the Transportation standards and guidelines in Chapter 4 of the Proposed Revised Forest Plan, include requirements for transportation system development and planning, and rock quarry and pit development, including soil protection and water quality measures. The Best Management Practices, which include numerous road-related guidelines, also apply (see Proposed Revised Forest Plan, Appendix C). The Riparian standards and guidelines have additional measures for roads located near streams. Log transfer facility guidelines are also contained in the Alaska Regional Guide, and the Proposed Revised Forest Plan adopts the "Log Transfer Facility Siting, Construction, Operation, and Monitoring/Reporting Guidelines" developed by the Alaska Timber Task Force (1986) (see Proposed Revised Forest Plan, Appedix G). These have been approved by the Environmental Protection Agency as standard conditions for log transfer facility permits issued under provisions of the Clean Water Act.

Water

Affected Environment

The Tongass National Forest can be characterized by its abundance of water. Southeast Alaska experiences a large amount of precipitation, primarily as rain at the lower elevations, and snow at the higher elevations. Much of the snow builds into glaciers which cover portions of the coastal mainland and some islands (e.g., Baranof). The maritime climate brings this precipitation nearly year-round, with the heaviest amounts occurring from September through January. The Tongass is influenced by the oceans and salt water. Thousands of miles of shoreline and hundreds of bays and inlets characterize the marine environment of the Tongass.

The 1991 SDEIS discussed several aspects of the water resource of the Tongass: its climate, streamflows, water quality and water uses; and its floodplain, wetland, and riparian habitats. That information does not need updating and most will not be repeated here, except as it is directly relevant to the analysis of environmental effects which follows, or as background to understanding the related treatment of fish and wildlife viability in other sections.

The Alaska Department of Environmental Conservation (ADEC) is responsible for preparing a statewide water quality assessment report every two years. ADEC's Draft 1996 Section 305(b) Water Quality Assessment Report identifies eight surface waterbodies in Southeast Alaska that are impaired due to pollutants from roads (Fubar Creek), log transfer facilities (Thorne Bay, Rowan Bay, Hobart Bay and Hamilton Bay) and forest products industrial facilities (Ward Cove, Silver Bay and Shoemaker Bay). Two of these impaired waterbodies are direct effects of Tongass National Forest management (Fubar Creek and Rowan Bay) and four are indirect effects of Tongass management (Thorne Bay, Ward Cove, Silver Bay and Shoemaker Bay).

For lands within the Tongass National Forest, including all ownerships, 77 percent of the watersheds in 1992 were classified as healthy (i.e., having watershed functions and conditions generally in balance) and 23 percent were classified as unhealthy (i.e., having watershed functions and conditions generally out of balance). For lands outside of Wilderness and roadless areas, 72 percent were classified as healthy watersheds, and 28 percent were classified as unhealthy watersheds (USDA Forest Service, Report to Congress, Anadromous Fish Habitat Assessment, January 1995, Appendix C, pages 15-16).

For Tongass National Forest lands, excluding other ownerships, 87 percent of the watersheds in 1992 were classified as having satisfactory watershed conditions, 10 percent were classified as having declining watershed conditions, and three percent were classified as having unsatisfactory watershed conditions (USDA Forest Service, Alaska Region Watershed Restoration Strategy, updated October 1995). The Alaska Region Watershed Restoration Strategy identifies watershed restoration needs in 37 waterbodies on the Tongass (16 on the Ketchikan Area, 11 on the Stikine Area and 10 on the Chatham Area) through fiscal year 1998.

The Tongass uses a stream channel classification system called channel typing. Stream channels are categorized into distinctly different groups, called process groups, which are used to assess watershed conditions, fish habitat production capabilities, and sensitivity to management activities. These process groups form the basis for the

Riparian standards and guidelines (see Proposed Revised Forest Plan, Chapter 4 and Appendix D).

Process groups are further defined by channel types - discrete segments of streams and rivers based on gradient, substrate, streambank vegetation, and other factors. This system provides a process for classifying and mapping streams by parameters that can then be used to estimate the response of different channel types to changes - natural or human-caused. Approximately 63 percent of the stream channels on the Tongass are classified in the high gradient contained process group (1991 SEIS).

Changes in any of the physical or chemical properties of water can directly affect water use by people, fish, and wildlife. For understanding the effects of the Forest Plan alternatives, the most important water quality factor is sedimentation. (Other factors discussed in the 1991 SDEIS, such as temperature and dissolved oxygen, do not differ appreciably by alternative, and will not be affected to a significant degree. These will not be discussed further here.)

Sediment is water-transported earth material. Sediment may be transported as either suspended load or bedload. Suspended sediment, which causes water to have a turbid or murky appearance, is carried within the water column, while bedload material moves (rolls or bounces) along the bottom of the stream or riverbed. Under natural conditions the great majority of sediment transport occurs during storm runoff.

Sediment production is controlled by natural erosion processes and can be accelerated by management activities. Soil mass movements (such as landslides), streams cutting new channels, and bank erosion are the main natural processes creating sediment. Landslides (see Soils) cause large, but temporary, increases in suspended and bedload sediments. Stream and riverbed or bank erosion may contribute to sediment over long periods of time. The steep terrain and heavy rainfall of Southeast Alaska make the land sensitive to natural sediment production, and to sediment produced by road construction and timber harvesting activities. Partly because of this, all roads are constructed of blasted quarry rock and nearly all logging uses cable yarding systems to reduce the disturbance of soil surface layers. But also because of the heavy rainfall, bared slopes tend to revegetate quickly. Overland flow is usually limited to roads, areas where the mineral soil is exposed, saturated depressions, or within barely-definable ephemeral channels.

In Southeast Alaska, suspended sediment loads in non-glacial streams in undisturbed watersheds are very low. Suspended sediment in glacial streams however is very high especially in summer months. Information on suspended sediment as the result of management activities is limited. The available studies are summarized in the 1991 SDEIS, and annual monitoring is providing more information. The studies generally show sediment yields from human activities falling within the ranges of natural variability, but also note the difficulty of separating out these two sources of sediment.

During 1994 an Alaska Anadromous Fisheries Habitat Assessment (AFHA) was conducted, for the purposes of studying the effectiveness of current procedures for protecting anadromous fish habitat, and determining if any additional protection was needed. This assessment concluded that current measures, and their implementation, were not fully effective in preventing habitat degradation or protecting salmon and steelhead stocks in the long term. The primary deficiency was the lack of protection for headwater streams and their watersheds. AFHA included recommendations to consider for the Tongass Plan Revision, and additional recommendations were made by the team that conducted on-the-ground analysis for AFHA. These recommendations have been considered in options for the proposed Riparian standards and guidelines (see Chapter 2, and the Proposed Revised Forest Plan, Chapter 4). AFHA is discussed more fully in the Fish section of this chapter.

The Forest's floodplains are associated with 21 percent of the miles of the streams mapped on the Forest (1991 SEIS). The potential flooding sites in the Tongass are the varying-width floodplains and terraces of the valley bottoms of U-shaped valleys. To date, no area-wide flood hazard or flood insurance studies have been conducted in the Forest.

Wetlands may be defined as "those areas that are inundated or saturated by surface or groundwater with a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (joint definition of the Army Corps of Engineers and the Environmental Protection Agency). Federal agencies with authority to manage Federal lands are required by Executive Order to avoid to the extent possible the long and short-term adverse effects associated with the destruction or modification of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. This presents a challenge to land management agencies in Alaska, where a high proportion of developable lands are wetlands and where compensatory opportunities are limited.

The technical details of classifying wetlands are included in the 1991 SDEIS. The wetlands of the Tongass include 1.15 million acres of peatlands (locally called muskeg), 1.38 million acres of forested lands, and another 720,000 acres of scrub-covered or riparian wetlands. Peatlands and/or muskegs comprise 35 percent of the total wetland area. These are usually open bogs or fens with an abundance of sphagnum moss and greater or lesser abundance of shrubs and low trees. Forested wetlands, which comprise over 40 percent of the total wetland area, typically have poorly drained soils and vegetative cover which ranges from scrubby mixed conifer forests to western or mountain hemlock stands.

Many forested wetland soils are capable of growing trees of “commercial” value, and are included in the suitable timber base. (The classification of suitable timber lands is discussed in the Timber section of this chapter.) Some wetland soil types currently considered suitable but that produce lower volume timber stands may not be supporting adequate re-growth of trees after logging. Further information is needed to determine whether or not these soils should be re-classified as not suitable (Forested Wetlands Suitability for Timber Harvest, August 1995). Until studies are completed, harvest on these soils will be minimized or avoided.

Riparian areas are streamside zones which generally include stream-associated vegetation (plants dependent on a perpetual source of water), and may include features of the stream channel (such as floodplains). Riparian ecosystems previously harvested for timber are now in various states of secondary plant succession. Except where the ground is highly disturbed, the species composition on these secondary successional riparian areas is very similar to the riparian vegetation prior to timber harvest, with spruce and hemlock dominating the tree canopy. On the more disturbed sites, the vegetation is often similar to primary successional species, such as occurs following deglaciation, with alder the commonest component.

Currently the management emphasis in riparian areas is to maintain habitats for fish and other riparian-associated resources. Management direction for meeting the basic requirements for protecting riparian areas is included in the National Forest

Management Act Regulations, the Tongass Timber Reform Act, and the Clean Water Act. In particular, the Tongass Timber Reform Act requires minimum 100-foot, no-commercial-timber-harvest corridors on either side of all class I fish streams, and all class II streams flowing directly into class I streams, "in order to assure protection of riparian habitat." Alaska State legislation also requires the use of stream buffers.

Between 1954 and 1990, approximately 25,700 acres of riparian old growth were harvested. This represents about 8 percent of the original 306,882 acres of riparian old growth outside Wilderness. Including an estimate for streams within Wilderness, to date only about four percent of the Forest's riparian old-growth forest has been clearcut.

Key water uses on the Forest include domestic water supply, recreation, growth and propagation of fish, and hydroelectric power generation. The Forest supplies domestic water for 18 permanent communities. Ketchikan, Sitka and Petersburg have enacted municipal watersheds. In addition, water is supplied from the Forest to nine fish hatcheries, three industrial sites, nine logging camps, and three resorts.

Hydroelectric generation is used in many places throughout the Tongass to provide electricity for mining, sawmills, pulpmills, communities and other uses. There are six major power installations on the Forest: Snettisham, south of Juneau; Beaver Falls, Ketchikan Lakes and Swan Lake east of Ketchikan; Tyee Lake south of Wrangell; and Blue and Green Lakes north and east of Sitka. Additional installations and interties between installations are proposed.

Environmental Consequences

This section considers the effects of forest management activities on stream flows, wetlands, and public water supplies. The effects of timber harvest and roads on fish and riparian resources are discussed in the Fish section of this chapter. The effects of sedimentation due to soil erosion and landslides are discussed in the Soils section of this chapter. The effects of log transfer facilities on the marine enviroment are discussed in the Transporation section of this chaper.

Forest management activities affect water quality and quantity, and the timing of water flows, through alteration of soil and watershed conditions. Most watersheds are in a state of dynamic equilibrium where changes occur naturally due to changes in weather patterns. Because of the overriding influence of climate, and basin resiliency, changes in streamflow and sediment delivery resulting from management activities (such as timber harvest) are difficult to measure.

Little is known about the effects of timber harvest and roads on stream flows in Southeast Alaska watersheds. The potential effects of increased stream flows within watersheds Forest-wide are expected to vary depending on the relative allocation of Land Use Designations and the applicable Forest-wide standards and guidelines for each alternative. The effects from changes in stream flows in a particular watershed can only be estimated during project planning, where the rate of entry into watersheds and locations of proposed roads and harvest units will be analyzed. The actual effects on stream flows can only be determined by site-specific monitoring.

The large amount and general distribution of wetlands throughout the Southeast Alaska landscape makes it difficult and expensive to avoid construction on wetlands if resource management activities are to occur. The chemical, physical and biological integrity of wetlands is affected mainly through timber harvest operations, which include the construction and maintenance of roads, landings, stream crossing structures, and log transfer facilities. Silviculture operations such as harvesting trees are generally exempted from Army Corps of Engineers permitting requirements. The construction or maintenance of forest roads in support of silvicultural practices, and temporary roads for moving mining equipment, are also generally covered under this exemption for the discharge of dredged or fill material into waters of the United States. This exemption is contingent on the construction and maintenance being conducted in accordance with the federal Best Management Practices as stated in 33 CFR 323.4(a)(6).

Table 3-85 shows the acreages of roads constructed in wetlands as of 1995, and the projected acres to be constructed in wetlands, by alternative, for the first and fifth decades. The 1995 total of 4,185 acres represents about 0.13 percent of the total inventoried wetland acres on the Forest. In the first decade, removal of wetlands from production as the result of new roads ranges from no additional acres in Alternative 1 to 2,685 acres in Alternative 7. By the end of the fifth decade, the amount of wetlands in a roaded condition ranges from 1,395 acres (Altnerative 1) to 12,435 acres (Alternative 7). At the most this is only slightly less than four-tenths of one percent (0.4 percent) of wetland acres Forest-wide. As road acres increase, some roads will cross wetlands. Those will be kept to a minimum number, width and total length consistent with the specific silvicultural operation.

Table 3-85
Existing (1995) and proposed roading in wetlands (in acres) [1]

Alternative	1995	Cumulative Acres at End of Decade 1	Cumulative Acres at End of Decade 5
1	4,185	4,185	4,185
2	4,185	5,796	9,693
3	4,185	5,277	7,290
4	4,185	4,755	5,685
5	4,185	4,728	5,604
6	4,185	5,604	8,277
7	4,185	6,870	12,435
8	4,185	5,622	8,304
9	4,185	6,564	11,571

(1) Based on an estimated average of 30 percent of road construction being on wetland soils and three acres per mile of road.

Mitigation

At present, 95 percent of all riparian areas, and 89 percent of all riparian areas in commercial forest land (current Forest Plan), are in a natural condition (see 1991 SDEIS). Riparian areas, as a component of aquatic and riparian ecosystems, will be protected through use of the Riparian standards and guidelines in all alternatives. In addition, the application of Best Management Practices will minimize or prevent adverse effects on water quality from the limited amount of riparian area within yarding corridors and stream road crossings, and from any non-commercial timber harvest that may occur.

The Enacted Municipal Watersheds LUD is applied to such watersheds in Alternatives 1-8. The Forest Service is considering whether to provide similar protection for other non-enacted municipal watersheds consistent with 36 CFR 251.9. Non-municipal watersheds will be managed under Forest-wide standards and guidelines (see Proposed Forest Plan, Chapter 4, Soil and Water).

Wild and Scenic Rivers

Affected Environment

The Wild and Scenic Rivers Act of 1968, as amended, provides a means for recognizing and protecting the outstandingly remarkable scenic, recreation, geologic, fish and wildlife, historic, cultural, ecologic and other values of selected rivers. The intent of including a river in the National Wild and Scenic Rivers System is to preserve the free-flowing condition of the river itself, as well as the characteristics of the river's immediate environment, for the enjoyment and benefit of present and future generations.

The process for adding rivers to the National system normally includes four steps: determining eligibility; classifying eligible rivers or river segments; determining suitability; and, finally, recommending eligible, suitable rivers for designation by Congress. To be eligible a river must be free-flowing and must have at least one outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or ecologic value; and this value should be a unique or exceptional representation for the area studied. Classification (into Wild, Scenic, or Recreational categories) is done according to the criteria in the Wild and Scenic Rivers Act, and includes considerations of remoteness, naturalness, accessibility, and prior development.

Suitability refers to how designation of a river fits into the current or proposed future management for an area. Suitability considers potential trade-offs with other resource values, landownership, and an estimate of the worthiness of the river to be a component of the National Wild and Scenic Rivers System. For the Forest Plan Revision, suitability was determined for each alternative, based on their general themes and resource goals. Recommendations for designation will come with the selection of a Revised Forest Plan in the Record of Decision. (These are preliminary administrative recommendation, which would then go through the Secretary of Agriculture for recommendation to Congress.) Suitability is discussed further under environmental consequences.

Some individuals and organzations have questioned whether ANILCA Section 1326(b) allows the Forest Service to pursue Wild and Scenic River studies. This section prohibits Federal Agencies from undertaking “single purpose studies leading to the establishment of new Conservation System Units” without specific authorization by Congress. Because the Forest Plan Revision is a comprehensive land management planning document for all National Forest resources, subject to other Federal laws requiring the evaluation of rivers, including the National Forest Management Act and the Wild and Scenic Rivers Act Section 5(d), the Forest Service has determined that it is not conducting a single purpose study, and that the inclusion of the analysis of Wild and Scenic River potential in that document is not in conflict with ANILCA Section 1326(b) and is consistent with the Wild and Scenic Rivers Act.

The 1991 SDEIS includes a detailed description of the process used to identify eligible rivers or river segments, and to classify them. That information is not repeated here. After considering all rivers and streams in the Tongass National Forest, 112 rivers with a total length of 1,394 miles were found to be eligible for consideration as components of the National Wild and Scenic Rivers System. For each of these, potential classifications were determined. These 112 rivers, their outstandingly remarkable values, and their potential classification are listed in the 1991 SDEIS, and additional information on their characteristics and resources is included in Appendix E of that SDEIS. (A few minor changes to classifications and segmenting have occurred since 1991. These are contained in the planning record. Appendix E has not been updated for the Revised Supplement, but will be completely updated for the FEIS.)

Congressional designation of a system of Wild and Scenic Rivers within the Tongass has many potential benefits. The undeveloped nature of the region presents a unique opportunity to identify the best candidates for addition to the system, and avoid the situation of "picking up the leftovers" as has often occurred in the rest of the United States. A wide range of outstanding values, for a variety of geological and ecological settings within a large geographic scale, have the potential to be represented. Such a system of rivers could complement the existing conservation units already designated (by Congress).

Environmental Consequences

Since there are over 100 eligible rivers in Southeast Alaska, and because there is strong interest by the State and many organizations and individuals for maintaining options for future resource development, in particular additions to the transportation and utility infrastructure, the question of "ripeness" for decision to recommend rivers to the National System was considered. This led to placing considerable weight on the question of whether or not a particular eligible river would make a worthy addition to the National System, with a strong focus on the ability of suitable rivers to represent the geographic diversity of Southeast Alaska. The Tongass was divided into seven major geographic areas or provinces, based on broad factors such as geology, climate, and topography. (These were discussed in the 1991 SDEIS under "Research Natural Areas." They are not the same as the biogeographic provinces used in the biodiversity and wildlife analyses.) The suitability analysis for each river in Appendix E discusses how well the river represents the geographic province in which is is located, compared to other rivers in that province.

The most "exemplary" rivers from this analysis were used for Alternative P in the 1991 SDEIS, and are carried over into Alternatives 2-6 here, with a few changes. Three rivers: Blue River, Marten Lake and Creek, and Harding River, were added; and two were dropped: Eagle River and Lake, due to public opposition and potential power system conflicts; and Aarons, Oerns, and Berg Creeks (considered one system), due to potential conflicts with mineral development and State transportation proposals.

Alternative 1 follows the suitability grouping used in the 1991 SDEIS for Alternative A, recommending all 112 eligible rivers. Alternative 9, the current plan, follows Alternative C in making no recommendations. Alternatives 7 and 8 use a modification of the recommendations for Alternative D, reducing the number of rivers recommended from 31 to 11 but retaining the emphasis of including only rivers with little potential to affect future commodity development. The recommended rivers for each alternative are displayed on the alternative maps.

Table 3-86 lists the miles of each river classification recommended in each alternative. Appendix E of the 1991 SDEIS describes in detail the anticipated effects of designation and non-designation with respect to the six suitability factors from Section 4 of the Wild and Scenic Rivers Act.

Table 3-86
Recommended river miles, by classification by alternative

Alternative	Classification Wild	Scenic	Recreational	Total Miles
1	1,085	154	55	1,394
2-6	287.5	86.5	57	431
7-8	211	0	0	211
9	0	0	0	0

The kinds and amounts of activities and changes acceptable within a river corridor (that is, in the sense of not altering or lowering a river's values) depend on what classification it is given and for which it would be recommended if designated. Forest Plan alternatives are not site specific, and it is not possible to describe precisely how an individual stream may be affected by future projects since their location and design have not been determined. It is possible to describe the general effects of various management activities on the eligibility and potential classification of rivers. This was done in the 1991 SDEIS. In Appendix E the effects of alternatives are described in more detail through the individual river suitability studies.

The kinds of forest management activities and uses with the potential to affect the classification or eligibility of rivers include timber harvesting and associated road construction, water project development, mining, recreation development, and fishery or wildlife habitat improvements. Timber management can have a major effect on a river's natural values, and Forest-wide it is the activity most likely to affect classification or eligibility. Most other activities will have site-specific effects if they occur, but these are not possible to estimate at the Forest Plan level. Where known (for instance, there are currently two water project proposals under consideration), these are discussed in Appendix E for individual rivers.

Conversely, the designation of a river as a component of the National Wild and Scenic Rivers System can affect the management or availability of resources. Study boundaries and final river corridors will preclude many activities, in particular those that would affect or lower river values. For Wild River segments, within which commercial timber harvest is not allowed, outputs of timber from suitable forest lands would be foregone, and Wild Rivers are withdrawn from mineral entry when designated. Construction of major recreation facilities, roads, powerlines, or hydroelectric projects is not allowed. Some opportunities for fish and wildlife habitat enhancement would also likely be foregone. Under Scenic and Recreational classifications, some of these effects would be less but still present. Scenic or Recreational classifications would not result in mineral withdrawals, however, and commercial timber harvesting could be allowed, subject to scenic quality requirements, if allowed in an adjacent LUD.

By itself, the non-designation of eligible rivers does not mean that outstandingly remarkable values will be compromised. LUD management prescriptions and Forest-wide standards and guidelines will ensure that many outstanding qualities remain. Exceptions would be water resource developments that could alter the free flowing characteristics of a river, and other modifications such as rip rap or major fish enhancement projects. Eligible rivers within an Intensive Development LUD are likely over time to only meet the criteria for a Recreational classification (depending on site-specific project location and design). Eligible rivers within Moderate Development

LUD's are likely over time to qualify only for Scenic or Recreational classification. Eligible rivers within Natural Setting or Wilderness LUD's are likely to retain their eligibility and existing potential classification; however, unless they are in Wilderness, the river corridors will remain open to mineral entry and the development of water resources. The actual implementation of these types of projects cannot be predicted.

Designating rivers within existing Wilderness and National Monuments, and the (legislated) LUD II areas, would have little effect on other resource uses, except for minerals outside of Wilderness. Designation would provide additional protection from the development of water and power projects by requiring Congressional approval (within Wilderness). The exceptions for management of Wilderness found in ANILCA that are less restrictive would not apply to Wild and Scenic rivers in Wilderness unless the legislation in the specific designation law includes those exceptions. Alternative 1 has 713 miles of recommended river within Wilderness and related areas, Alternatives 2-6 each have 240 miles, and Alternatives 7-8 each have all 211 miles. Alternative 9 has no recommended rivers.

Other effects will now be discussed by alternative. Timber harvesting is not allowed within the corridor of a Wild River, or within Scenic or Recreational corridors adjacent to land use designations not allowing harvest. (An average 1/4-mile corridor on each side of the river is used for the acreage figures below. Actual corridor boundaries would be determined at the time of river designation.) Limited timber harvesting is allowed within a Scenic or Recreational corridor adjacent to a LUD allowing harvest. For most alternatives, Riparian Area Standards and Guidelines developed since the 1991 SDEIS are more restrictive than those in the SDEIS. These will provide additional protection for the values of eligible rivers not recommended in an alternative. Also, the various conservation strategies added to the former Alternative P (that is, Alternatives 3-6) and to Alternative 7 (Alternative 8) will provide additional protection for those same values. These effects have not been quantified.

Alternative 1. All 112 eligible rivers with 1,394 miles are recommended for designation as Wild, Scenic or Recreational Rivers. Designation would place a total of 721,989 acres in the National Wild and Scenic Rivers System and would preserve the free-flowing character and outstandingly remarkable values of all eligible rivers. The classification of the recommended rivers is compatible with the proposed management of adjacent lands Forest-wide.

These designations would eliminate the opportunity for major water resource developments on 1,394 miles of river. The 271,160 acres to be managed as Wild Rivers outside of existing Wilderness would be withdrawn from mineral entry. The river corridors in this alternative contain 66,020 acres of tentatively suitable forest that would be unavailable for timber harvest. Restricted harvest would be allowed on 26,250 acres of tentatively suitable forest within the Scenic and Recreational River corridors where the adjacent land use designation allows timber harvest.

Alternatives 2-6. Twenty-five eligible rivers with 431 miles are recommended for designation as Wild, Scenic or Recreational Rivers. Designation would place a total of 238,817 acres in the National Wild and Scenic Rivers System and would preserve the free-flowing character and outstandingly remarkable values of all eligible rivers. The classification of the recommended rivers is compatible with the proposed management of adjacent lands in most areas.

These designations would eliminate the opportunity for major water resource developments on 431 miles of river. The 57,860 acres to be managed as Wild Rivers outside of existing Wilderness would be withdrawn from mineral entry. The river corridors in this alternative contain 15,660 acres of tentatively suitable forest that would be unavailable for timber harvest. Restricted harvest would be allowed on 19,820 acres of tentatively suitable forest within the Scenic and Recreational River corridors where the adjacent land use designation allows timber harvest.

Alternatives 7-8. Eleven eligible rivers with 211 miles are recommended for designation as Wild, Scenic or Recreational Rivers. Designation would place approximately 110,000 acres in the National Wild and Scenic Rivers System and would preserve the free-flowing character and outstandingly remarkable values of all eligible rivers. The classification of the recommended rivers is compatible with the proposed management of adjacent lands Forest-wide. These designations would eliminate the opportunity for major water resource developments on 211 miles of river. Since all its recommendations are within Wilderness, it would not remove any tentatively suitable acres from the timber land base, or withdraw any additional acres from mineral entry.

Alternative 9. No rivers are recommended for designation. With no designation, there are no effects to other resources and uses. The eligible rivers are subject to multiple use management in accordance with the land use designations of adjacent lands. Eligible rivers in Wilderness, National Monuments and legislated LUD II areas would likely retain their free-flowing character and outstandingly remarkable values. The 669.5 miles of eligible rivers outside these areas would be subject to various levels of change over time. They retain the opportunity for water resource development.

The final outcome of the eligible rivers rests with Congress. The Forest Plan Revision is the vehicle to look at the broad perspective of identifying a reasonable range of representative rivers, along with consideration of the other resource values the forest provides. The Revision Record of Decision will include the final set of recommended rivers. In the interim, all 112 rivers will be managed in accordance with the guidelines and objectives contained in the Wild and Scenic Rivers Act and subsequent guidelines.

Wilderness

Affected Environment

Congressionally designated Wilderness in the Tongass National Forest comes from two pieces of legislation. The Alaska National Interest Lands Conservation Act (ANILCA) of 1980 established 14 Wildernesses totaling 5.5 million acres within the Tongass. Two of the areas, Admiralty Island and Misty Fiords, were also designated as National Monuments. Prior to ANILCA there was no designated wilderness on the Tongass. In 1990, the Tongass Timber Reform Act (TTRA) amended ANILCA and designated five new Wildernesses and one Wilderness addition totaling 296,080 acres. This brings the total to 5.7 million acres in 19 Wildernesses on the Tongass National Forest. The 14 ANILCA Wildernesses are described in detail in the Analysis of the Management Situation (1990), and the TTRA Wildernesses are described in the 1991 SDEIS. No additional Wilderness proposals, or any changes to existing Wilderness, are being proposed at this time.

The various wildland ecosystems of Southeast Alaska are represented within the Tongass' Wilderness. These areas include glaciers and icefields, off-shore islands and seacoasts facing both the open Pacific Ocean and inland passages, major river systems, and 1.5 million acres of old-growth temperate rain forests. Two of the largest areas, Kootznoowoo (Admiralty Island) Wilderness and Misty Fiords National Monument Wilderness, contain vast, virtually intact ecosystems. The Wildernesses are mostly in a pristine condition, with the imprint of humans generally not noticeable. They offer outstanding opportunities for solitude and primitive recreation.

Monitoring has been minimal in most of the Wilderness, but has shown some resource damage and user conflicts in localized concentrated use areas. Monitoring in some of the more remote areas, such as South Prince of Wales and Coronation Island Wildernesses, indicates very little use but some resource damage and occupancy trespass. The areas with the greatest use and most management activities tend to have the greatest need for additional management direction to help resolve user conflicts and preserve the wilderness resource.

Through ANILCA, Congress reaffirmed and expanded upon the purposes of wilderness as stated in the 1964 Wilderness Act, specifically for wilderness established in Alaska. In recognition of unique situations and established uses in Alaska, ANILCA also provided a number of important specific exceptions to the prohibitions of the Wilderness Act. These are described in the 1991 SDEIS, and form the basis for the Wilderness and National Monument LUD prescriptions in the Proposed Revised Forest Plan. The TTRA Wilderness is under the same direction, since TTRA was an amendment to ANILCA.

Implementation of existing direction has varied greatly between the various wildernesses. Some areas, such as Kootznoowoo (Admiralty Island) and Misty Fiords Wildernesses, have had significant management programs and accomplishments, while others have had minimal management activities. Some of these activities, such as fisheries enhancement projects and the authorization of temporary facilities for the taking of fish and wildlife, have resulted in administrative appeals by user groups who view these activities as conflicting with their use or with wilderness values.

Environmental Consequences

The principal effect of implementing any of the alternatives will be to apply the Wilderness and National Monument Wilderness land use designations to all designated wilderness. The management prescription standards and guidelines will provide for more consistent management. All existing Tongass Wilderness is withdrawn from mineral entry (subject to valid existing rights); no additional effects on other resources and uses are anticipated.

Wildlife

Affected Environment

The Tongass National Forest provides habitat for 54 species of mammals (including the recently introduced elk on Etolin Island), 231 species of birds, and five species of amphibians and reptiles. There are an additional 18 species of marine mammals found in Southeast Alaska which depend entirely on the ocean environment, and 45 bird and 3 amphibian or reptile species considered casual or accidental visitors to Southeast Alaska. These species provide many opportunities for consumptive and nonconsumptive uses, including commercial, sport, and subsistence hunting, and photographic and viewing activities. The Forest is rich in its varied and unique species; some of the species found on the Forest in relative abundance (such as bald eagle and brown bear) are threatened or endangered in other parts of the United States. The 1991 SDEIS has a more detailed overview of Tongass's wildlife species.

The Affected Environment portion of this Wildlife section is divided into two parts: a discussion of important wildlife species and their habitat needs, including management indicator species and other species of concern; and a short discussion of consumptive uses of wildlife (primarily hunting and trapping). Information from the 1991 SDEIS will be supplemented and updated with more recent information on key wildlife species and habitats, including information from several assessments and reports completed this year.

Indicator Species

Management indicator species (MIS) are vertebrate or invertebrate species whose response to land management activities can be used to predict the likely response of other species with similar habitat requirements. Through the MIS concept, the total number of species that occurs within a planning area is reduced to a manageable set of species that collectively represent the complex of habitats, species, and associated management concerns. MIS are also used to help establish management goals for species in public demand. The National Forest Management Act regulations prescribe the use of management indicator species.

The 1991 SDEIS identifies 13 management indicator species, and describes each in detail, with an emphasis on their habitat needs. The species-by-species information is briefly summarized below, with more attention given to those MIS species having special management concerns (brown bear, marten, Sitka black-tailed deer, and gray wolf). The gray (or Alexander Archipelago) wolf information is also updated based on a recent assessment of that species. Two other species of special management concern and for which assessments were conducted, northern goshawk and marbled murrelet, will be discussed after the MIS discussions. Table 3-88, which follows these discussions, summarizes some of the information for these six species of concern.

Although some of the MIS are associated with several habitat types, all are associated with the spruce and hemlock forests of Southeast Alaska. It is these forests which represent 98 percent of the productive old-growth forests of the Tongass (see Biodiversity section). Six of the 13 species also specifically use stream (riparian) habitats, and 5 estuarine habitats. (These and other habitat components, and conifer forest successional stages, are described in the Biodiversity ection.) Table 3-87, modified from the SDEIS, indicates the relative importance of conifer successional stages as habitat for the MIS. It can be seen that productive old growth (that is, conifer stands greater than 200 years in age and having a volume of 8,000 board feet per acre or higher) provide essentially all of the highly-important habitats, and the preponderance of the moderately-important habitats, for all the MIS.

In the 1991 SDEIS, and previously for the Revision, a "habitat capability model" was used to estimate existing and future habitat for each MIS. These models were used primarily as relative measures of the effects on habitat of Forest Plan alternatives by indicating relative habitat capability. Few of the models had received field review or testing. Model "outputs" were often expressed in species population numbers, giving the misleading impression that actual numbers of individuals were being indicated. Population numbers for many species can vary widely from year to year as a result of many factors other than habitat capability.

Table 3-87
Relative importance of conifer successional stages as habitats for management indicator species

Species (Season)	Successional Stages					
	Early (in years)	Mid (in years)		Late (>200 years)		
					Productive Old-Growth Volumes	
	0-25	26-150	150-200	Unproductive Old-Growth	Low-Med.	High
Red Squirrel (5)	L	L-H	H	L	M-H	M-H
Black Bear (2,3,4)	M	L	L	M	M-H	M-H
Brown Bear (3)	L	L	L	M-H	M-H	M-H
Marten (1)	L	L	L	L	M	H
River Otter (2,3)	L	L	M	L	H	H
Sitka B-t Deer (1)	L-M	L	L-M	L-M	M	H
Mountain Goat (1)	L	L	L	L	M-H	H
Gray Wolf (5) *	-	-	-	-	-	-
Van. Can. Goose (2,3)	L	L	L	H	H	H
Bald Eagle (2,3)	L	L	L	L	H	H
Red-br. Sapsucker (2,3)	L	L	L	L	H	M
Hairy Woodpecker (1)	L	L	L	L	L	M-H
Brown Creeper (1)	L	L	L	L	L	L-H

H = Highest importance, high population densities
M = Moderate importance, moderate population densities
L = Least importance, low population densities
Season codes: 1 = winter, 2 = spring, 3 = summer, 4 = fall, 5 = all year
* Gray wolves use habitats according to the abundance and availability of prey species (primarily Sitka black-tailed deer).

Other limitations of the models are: there were designed to be used with a timber volume classification scheme which has been replaced with an updated scheme for the Revised Supplement; they were not developed for some of the species of concern; and they are not necessarily appropriate for use in population viability analysis. For all these reasons, most of the habitat capability models are not used for the Revised Supplement. Information on the MIS and other species follows, most of it summarized from the 1991 SDEIS.

Mountain Goat

Mountain goats represent species using cliffs, alpine and subalpine, and old-growth forest habitats. Hunted populations are sensitive to overharvest and human disturbance. The quantity and quality of winter habitat is the most limiting factor for mountain goats in Southeast Alaska: old-growth trees with large dense crowns have the highest value because they intercept the most snow and provide understory forage plants. Lack of snow interception in early successional stages, and lack of forage in middle successional stages, reduces their value as habitat. They may also be sensitive to low-level aircraft flights over summer alpine habitats. Historically, mountain goats in Southeast Alaska were present only on the mainland, but have more recently been transplanted to many of the islands.

Sitka Black-tailed Deer

Sitka black-tailed deer are indigenous to the coastal regions of Southeast Alaska and northwest British Columbia; this subspecies of mule deer occupies the northern-most extreme of black-tailed deer habitat. Deer are strong swimmers, and have occupied almost all islands of the Alexander Archipelago capable of supporting them. On the mainland, deep snow and harsh winters limit populations more than on the islands.

Sitka black-tailed deer are the wildlife species receiving the highest sport hunting and subsistence use of all terrestrial species in Southeast Alaska. The State of Alaska and the Federal Subsistence Board are responsible for the numbers of deer allowed to be taken for harvest. Sitka black-tailed deer represent species using lower elevation old-growth forest habitats during the winter period. The quantity and quality of winter habitat is considered the most limiting factor for Sitka black-tailed deer in Southeast Alaska. There are about 7.0 million acres of forested land (all age classes and types of conifer forests) below 1500 feet elevation within occupied deer habitat on the Tongass National Forest.

The deer winter habitat capability model takes into account snow depths/winter severity, the value of lower elevations and the more-southerly aspects, and successional stages. Old-growth forests have the highest value because they intercept snow and provide understory forage plants. Lack of snow interception in early successional stages, and lack of forage in middle successional stages, reduce their value as habitat.

Sitka black-tailed deer disperse through and use a variety of vegetational communities throughout the year, and no specific corridor requirements have been identified. Wolf predation can act as a significant controlling factor on deer populations.

River Otter

River otters are associated with coastal and fresh water aquatic environments and the immediately adjacent (within 100-500 feet) upland habitats. Their distribution is Forest-wide in suitable habitats. Beach characteristics affect the availability of food and cover, and adjacent upland vegetation is also important in providing cover for otters. Old-growth forests have the highest habitat value, providing canopy cover, large-diameter trees and snags, and burrow and den sites. Younger successional stages provide lower quality habitat.

Marten

Marten naturally inhabit the mainland of Southeast Alaska, and natural populations occur on Kuiu, Kupreanof, Mitkof, and Revillagigedo Islands. Transplanting by humans introduced marten to Prince of Wales, Chichagof, and Baranof Islands between 1930 and 1950. Marten represent species using lower elevation old-growth forest habitats during the winter season. The quantity and quality of winter habitat is the most limiting factor for marten in Southeast Alaska. There are about 8.0 million acres of forested land (all age classes and types of conifer forests) below 1500 feet elevation within occupied marten habitat on the Tongass. Due to lower snow accumulation, habitats at lower elevations have higher value for wintering marten. Coastal habitats (beach fringe) and riparian areas have the highest value, followed by upland habitats below 1500 feet in elevation. Of the successional stages, old-growth forests have the highest value because they intercept snow, provide cover and denning sites, and provide habitat for prey species used by marten. Early successional stages do not provide these habitat components and have lower habitat value. Marten show a habitat-use relationship with the size of a habitat area. Optimum use occurs when patches of preferred habitat are greater than 180 acres. Dispersal between islands is limited, but marten are fairly mobile on land. Conifer corridors facilitate movement and dispersal. (See also Table 3-88.)

Forest management activities resulting in increasing access may result in the potential for overtrapping. New roads provide additional access for trappers and may indirectly cause increased harvests. Marten are easily trapped and can be overharvested.

Brown Bear

Brown bears are present on the mainland and on the islands north of Frederick Sound. They are occasionally reported on Mitkof, Etolin and Wrangell Islands south of Frederick Sound, but are not found on any of the other islands in Southeast Alaska. Brown bear use areas from sea level to the alpine, and require large expanses of habitat and protection from human disturbances. Some of the highest brown bear population densities in the world are found within the Tongass. There are about 7.9 million acres (excluding rock, permanent ice fields, and acres of lakes) within occupied brown bear habitat on the Tongass, with 7.5 million acres of that considered roadless.

The late-summer season has been identified as the most critical or limiting period for brown bear. During this season, the bears concentrate along low-elevation valley bottoms and salmon streams. These are often the same areas of highest human use and most intense resource development activities. During this season, brown bears use a variety of habitats, with estuaries and riparian areas having the highest habitat value. Streams and rivers that produce anadromous fish have a higher value for brown bears than resident fish streams. Brown bears have not been identified as a species requiring minimum patch sizes of a particular habitat type. They do not have specific vegetation corridor requirements, as they travel and disperse through a variety of terrain and vegetative conditions. (See also Table 3-88.)

Increases in human activity in an area may result in increased direct human-induced deaths of bears. This can result from increased legal hunting, illegal kills, wounding losses, and from the defense of life or property. From 1990 to 1995, 67 brown bear kills not associated with legal hunting seasons occurred.

Black Bear

Black bear are present throughout the mainland, and on the islands south of Frederick Sound. They use habitats from sea level to the alpine, and require large expanses of habitat and protection from human disturbances. Black bear are not as susceptible to human disturbance as brown bear. There are about 9.4 million acres (excluding rock, permanent ice fields, and acres of lakes) within occupied black bear habitat on the Tongass National Forest, with 8.3 million acres considered roadless. Estuarine, riparian, and forested coastal habitats receive the highest use by black bears and appear to have the highest habitat values. Within forested areas, both early and late (old-growth) successional stages provide the best forage and/or cover for black bears. Black bears prefer anadromous fish streams to resident fish streams, are very mobile on land, and do not have specific vegetation corridor requirements.

Although black bears can adapt to changes in their environment caused by humans, human-related mortality often reduces the total density of black bears. From 1990 to 1995, 87 black bear kills not associated with legal hunting seasons occured.

Gray (Alexander Archipelago) Wolf

Two Alaskan subspecies of the gray wolf are currently recognized. The wolf found in Southeast Alaska is known as the Alexander Archipelago wolf. It inhabits the mainland and the islands south of Frederick Sound. Wolves require an adequate prey base of ungulates, beaver, and salmon; in most areas of Southeast Alaska the Alexander Archipelago wolf depends heavily on deer. Suitable habitats for wolves equate to areas capable of supporting this prey base. Wolves use a wide variety of habitats when prey are present, and can affect prey populations in those areas.

Due to social interactions, wolf densities do not exceed certain levels even when prey abundance is high. Densities of 0.1 adult wolf per square mile are considered high, and this density is generally accepted as the saturation point beyond which wolf populations would not expand. Wolves have large home ranges (about 100 square miles per pack), use a wide variety of habitats, and are very mobile. They do not have specific vegetation corridor requirements, as they travel and disperse through a variety of terrain and vegetative conditions. (See also Table 3-88.)

Wolves are legally hunted and trapped in Southeast Alaska. Increased roaded access and increased human activity likely increase wolf deaths, both from legal and illegal hunting and trapping. Road management and increased regulation of legal harvests are seen as short-term needs to reverse population declines.

A concern for the viability of this subspecies was illustrated by a petition to list the Alexander Archipelago wolf as Threatened under the Endangered Species Act. The Fish and Wildlife Service accepted the petition, confirming the concern, but concluded that listing was not warranted at this time. The viability concern has two components: a short-term concern that current mortality rates may not be sustainable; and a long-term concern over potential declines in Sitka Black-tailed deer habitat capability, the principal prey of wolves.

An interagency wolf conservation assessment has been conducted to synthesize available information on wolf ecology and identify management considerations for sustaining a viable wolf population on the Tongass. The assessment concluded that wolf densities are generally lower on the mainland and higher on islands in the southern half of the Tongass. Principal concerns exist on Prince of Wales and Kosiuscko Islands where past timber harvest has reduced deer habitat capability and resulted in road densities exceeding 0.4 road miles/square mile of land. Wolf mortality rates have exceeded 50 percent the last 3 three years within a sample of radio-marked wolves; trapping and hunting harvest rates were positively correlated with road density. Planned timber harvest will continue declines in deer habitat capability by a combination of forest fragmentation and reductions in important deer winter range. Important components of a wolf conservation strategy include providing minimally-roaded core habitats, maintaining wolf harvest within sustainable limits through regulations, and providing adequate deer habitat to support an abundant and stable deer population.

Red Squirrel

Before 1930, red squirrels in Southeast Alaska existed only on the mainland. In 1930 and 1931 they were introduced to Baranof and Chichagof Islands as a potential prey species for the introduced marten, and today red squirrels are abundant on many of the islands and the mainland. Red squirrels require forests with cone-producing trees and cavities in trees and snags. They represent a species which can do fairly well in seed-producing second-growth timber stands. There are about 8.4 million acres of forested land (including all age classes and types of conifer forests) within occupied red squirrel habitat on the Tongass National Forest. Habitat usually does not exist for red squirrels above 2000 feet in elevation; spruce trees and mature to old-growth forests have the highest values for red squirrel habitat. Optimum habitat use occurs when patches of preferred habitat are greater than 30 acres. Corridors of pole timber or older stands of trees facilitate movement and dispersal.

Bald Eagle

Some of the highest bald eagle populations in the world are found in Southeast Alaska. Their nesting habitat is primarily old-growth trees along the coast and within riparian areas. The most recent adult population estimate (1987) was over 12,000 birds; over 8,000 nest sites have been identified to date (1995). There are about 772,000 acres of beach and estuary fringe on the Tongass, with 643,000 acres considered roadless. The U.S. Fish and Wildlife Service and the USDA Forest Service maintain an interagency agreement for bald eagle habitat management in the Alaska Region, which includes standards and guidelines for regulating human disturbance within identified bald eagle use areas. All identified eagle nest trees are protected within a forested buffer having a minimum radius of 330 feet.

Red-breasted Sapsucker

The red-breasted sapsucker is found throughout Southeast Alaska during the spring, summer and early fall seasons, wintering in the coastal portion of its breeding range as far north as Prince of Wales Island. Red-breasted sapsuckers are summer residents which require old-growth forest habitats with snags. They are called primary excavators because they create cavities for other cavity-using wildlife species. There are about 9.9 million acres of forested land (includes all age classes and types of conifer forests) within occupied red-breasted sapsucker habitat on the Tongass National Forest. The quantity of snags has a direct relationship to the number of red-breasted sapsuckers within an area. Old-growth forests provide the best snag habitat over the long term, with the lower volume classes of old growth receiving more use than higher volume classes. Optimum habitat use occurs when patches of preferred habitat are greater than 250 acres.

Hairy Woodpecker

Associated with snags and partially dead trees for foraging and nesting, the hairy woodpecker is considered an uncommon, permanent resident throughout Southeast Alaska. Hairy woodpeckers require old-growth forest habitats with snags. Like the red-breasted sapsucker, hairy woodpeckers are primary cavity excavators for other cavity-using wildlife species. Their winter habitat may be their most limiting. There are about 9.9 million acres of forested land (includes all age classes and types of conifer forests) within occupied hairy woodpecker habitat on the forest. Snag quantity has a direct relationship with the potential of an area to support hairy woodpeckers. Old-growth forests provide the best long-term snag habitat, with higher volume old-growth stands receiving more use than lower volume stands. Optimum habitat use occurs when patches of preferred habitat are greater than 500 acres.

Brown Creeper

Associated with large old-growth trees, the brown creeper is considered an uncommon, permanent resident throughout Southeast Alaska. This species is most dependent on high-volume old growth. There are about 9.9 million acres of forested land (includes all age classes and types of conifer forests) within occupied brown creeper habitat on the forest. Winter habitat has been suggested as the limiting factor for cavity-nesting birds including the brown creeper. Optimum habitat use occurs when patches of preferred habitat are greater than 15 acres.

Vancouver Canada Goose

Vancouver Canada geese are distributed throughout the Alexander Archipelago of Southeast Alaska, with an estimated resident population of 10,000 birds in the northern half of Southeast. This population is relatively non-migratory, with the majority of birds moving only locally between nesting, brood rearing, molting, and winter concentration areas. Vancouver Canada geese use wetlands (both forested and non-forested) in the estuary, riparian, and upland areas of the forest. Nesting and brood rearing habitats (estuaries, non-forested wetlands, and certain old-growth forest types) are potentially affected by various Forest management activities; there is some evidence that geese avoid roaded areas. Vancouver Canada geese are highly mobile and are found throughout the islands of Southeast Alaska. Vegetative corridor requirements have not been identified.

Other Species of Concern

Although not a management indicator species, information on moose habitats and populations has been included at the request of the Alaska Department of Fish and Game. Two other wildlife species are currently species of concern for which recent assessments (similar to the one for the Alexander Archipelago wolf) have been conducted. These are the Queen Charlotte (or northern) goshawk, and the marbled murrelet. Both are discussed in the 1991 SDEIS, the murrelet in the Threatened, Endangered and Sensitive Species section, the goshawk as part of the Wildlife Environmental Consequences. The murrelet information is still valid, and is supplemented with the recent assessment here. The goshawk discussion, however, was conjectural, and is entirely replaced by assessment information, which includes results of recent field studies and monitoring.

Moose

Moose migrated down the major river systems from Canada into Southeast Alaska during the early 20th century; they were first reported at Yakutat between 1930 and 1932. All moose in Southeast result from these natural migrations except those at Berner's Bay, which were transplanted there in the mid-1960's. The current post-hunt moose population for Southeast Alaska is estimated to be 2,530 animals (1991), with about 75 percent of them residing in the Tongass National Forest.

Moose habitat in Southeast Alaska is associated primarily with riparian and post-glacial early-successional vegetation types. In most areas, much of the moose habitat is declining as a result of natural plant succession. Succession in some areas is transforming deciduous vegetation types (cottonwood, willow, etc.) into conifer stands. In other areas, climax deciduous vegetation is growing to sizes less valuable as moose browse. In some moose habitat areas, clearcut logging has returned conifer stands to early successional vegetation types which may temporarily (for about 25 years) create or enhance forage for moose. These short-term advantages of clearcutting may be offset by the longer period of reduced forage in the second-growth conifer forest.

Marbled Murrelet

The marbled murrelet is a robin-sized seabird. It feeds below the water's surface on small fish and invertebrates, and is usually found within five miles of shore. Marbled murrelets nest on land and lay only one egg. Unlike most other species in the family Alcidae, they do not nest in colonies, although at some sites they may nest in small aggregations. Except for the fall period when they are molting, flightless, and stay on the ocean, murrelets are known to fly to tree stands throughout the year.

Throughout much of its range in the Pacific Northwest, British Columbia, and Alaska, the marbled murrelet nests in large, mature coniferous trees within stands of structurally complex, coastal old-growth forest. Marbled murrelet nesting habitat relationships are poorly understood in Southeast Alaska. Data from forested areas elsewhere within their range indicate that higher volume stands of old-growth conifer forests in relatively close proximity to the coast are essential nesting habitat. (See also Table 3-88.)

Recent surveys suggest that marbled murrelets are numerous and widespread throughout the coastal waters of Southeast Alaska, with estimates ranging from 70,000 to 434,000 birds. Population trends are generally unknown, but published estimates range from a 4-6 percent annual decline to a 50 percent decline over 20 years throughout Alaska. However recent analysis of data from Southeast Alaska does not indicate population declines. Possible causes of estimated overall Alaska declines are oil spills, mortality from gill netting, cyclic changes in marine food productivity, and the harvesting of productive old-growth forests (which are likely their primary nesting habitat).

The listing of this species as threatened in Washington, Oregon, and California, and the reductions in habitat from timber harvesting, have raised concerns for the viability of this species in Southeast Alaska. An interagency conservation assessment (U.S. Fish and Wildlife Service, 1995) was conducted to synthesize literature and data from Southeast Alaska to describe the natural history, habitat relationships and conservation status of the marbled murrelet. The assessment noted the uncertainties over how best to maintain habitat for viable, well-distributed populations of marbled murrelets in Southeast Alaska. Conceptually, uneven-aged silvicultural practices or extended harvest rotations may maintain sufficient forest structure to support nesting murrelets. However, given the uncertainties, the assessment concluded that a murrelet conservation strategy should consider a reserve-based approach, especially in those biogeographic provinces where substantial timber harvest has been concentrated and is projected to continue.

Queen Charlotte (Northern) Goshawk

The northern goshawk inhabits forested lands throughout North America, favoring dense stands of conifer or deciduous old growth for nesting habitat. The Queen Charlotte goshawk is recognized as a distinct subspecies, and as such is found only in coastal areas of British Columbia and in Southeast Alaska. Within Southeast Alaska, the goshawk appears to be non-migratory, although it may occupy different, or overlapping, winter and breeding territories. Goshawks are medium-sized hawks and prey primarily on other birds (within Southeast Alaska, Steller's jay and varied thrush are common prey species). Prior to recent field studies, very little was known about goshawks within the Tongass. (See also Table 3-88.)

A viability concern exists for the northern goshawk in Southeast Alaska due to its association with mature and old-growth forests and the decline in these habitats from timber harvesting. This concern was highlighted when the Fish and Wildlife Service (FWS) received and assessed a petition to list the Queen Charlotte Goshawk as endangered under the Endangered Species Act. Although the FWS determined that listing is not warranted at this time, they did express concern over goshawk population viability. The FWS and the Forest Service are working cooperatively to address goshawk viablity through the Forest Plan Revision.

A conservation assessment (Hayward et al., 1995) has been conducted to synthesize literature and original data from Southeast Alaska to describe the habitat relationships and conservation status of the northern goshawk. Productive old-growth forest is a critical component of goshawk habitat use patterns. Radio-marked goshawks consistently select this forest habitat type, with over 67 percent of summer, and 77 percent of winter, habitat use occurring in productive old growth. Most other habitat types (such as alpine, subalpine, peatland (muskeg), and clearcuts) were used infrequently or avoided by goshawks. Timber harvesting in the Tongass (and on private lands in Southeast Alaska) results in the conversion of old-growth forest - a selected habitat type, to young-growth forest - an avoided habitat type, and thus a decline in goshawk habitat capability.

An evaluation of silvicultural techniques suggests that stand structures preferred by goshawks could be maintained using uneven-aged practices. Additionally, goshawk habitat theoretically could be maintained across the landscape under a 300-year timber harvest rotation. A risk assessment using a conceptual 300-year timber harvest rotation revealed that several landscapes (including the North Prince of Wales biogeographic province) within the Tongass may be at risk of not sustaining goshawks under current management. The assessment suggests that a combination of reserve-based and dynamic-landscape management approaches could sustain well-distributed viable populations of goshawks across the Tongass.

Table 3-88 summarizes some of the above information for the six "species of concern" (Alexander Archipelago wolf, northern goshawk, marbled murrelet, Sitka black-tailed deer, brown bear, and marten - deer is not listed separately, but included under wolf), and presents additional information on habitat and possible conservation approaches from the Viability Synthesis (June 1995).

Table 3-88
Some important habitat components and conservation options for the species of concern

Habitat Components or Considerations	Conservation Options
Marten	
Highly productive old growth (VC 5+) 2 sq. mi./female; 3 sq. mi./male Mean dispersal range = 16 miles Forested riparian corridors and beach fringe Other considerations: Roaded access/level of trapping	Large, medium and small habitat areas: areas of 34,000 acres, 25 miles apart; areas of 6,800 acres, 9 miles apart, or 13,600 acres, 16 miles apart; and areas of 2,100 acres, 1/large watershed Consider road density and management
Northern Goshawk	
Productive old growth (VC 4+) Nest sites below 800 ft. elevation Large (10,000-30,000 acres) use areas of mixed habitats	Maintain productive old growth within large watersheds so that at least 33 percent is 100-200 years old, and 33 percent 200-300 years old. Nesting habitat (600+ acres) available in each 10,000-30,000 acre watershed
Marbled Murrelet	
Productive old growth (VC 4+) within 31 miles of the ocean, and at lower elevations in heads of bays Other considerations: Gillnet mortality and other at-sea effects	Maintain productive old growth in heads of bays, emphasizing those near aquatic or terrestrial concentration areas
Alexander Archipelago Wolf	
Suitable habitat for prey species, especially Sitka black-tailed deer Other considerations: Road density and roaded access for trapping	Maintain habitat to support ample prey populations. For deer maintain VC 5+ old growth in winter range. Consider a deer-density objective within wolf range; control roaded access and work with ADF&G to manage illegal kills.
Brown Bear	
Productive anadromous fish habitat Large unroaded areas with availability of summer alpine habitat Other considerations: Road density and roaded access. Camp and community waste disposal sites.	Unroaded areas of 40,000 acres containing productive fisheries, 20 miles apart. 333' buffers on low-gradient anadromous fish streams to provide screened foraging habitat Manage human activity to minimize encounters and illegal kills; consider ways to concentrate human activity within landscapes.

Source: Viability Synthesis Workshop, June 1995

Consumptive Use of Wildlife

A number of the wildlife species on the Tongass are important for subsistence and sport hunting, and some for trapping. The 1991 SDEIS contains detailed information on hunting and trapping over the past decade for each of several species: Sitka black-tailed deer, mountain goat, brown bear, black bear, moose, wolf, marten, river otter, and waterfowl (collectively). All of these species have hunting and/or trapping seasons managed by the Alaska Department of Fish and Game, except that quite recently the Forest Service took over management of subsistence uses, including subsistence hunting. Thus the primary source of information on annual hunting and trapping is the Alaska Department of Fish and Game. Except for a summary for Sitka black-tailed deer, consumptive use information is not repeated here. (See also the Subsistence section for more information on subsistence uses of wildlife.)

Sitka black-tailed deer is by far the most important, and most "harvested," terrestrial wildlife species for subsistence purposes, and for sport hunting. Between 1987 and 1994, an average of 15,000 deer were killed annually within the Tongass National Forest. Over the past 15 years deer harvests in Southeast Alaska have increased by 170 percent.

Deer harvests have not been evenly distributed throughout Southeast Alaska. Of the total deer harvested between 1980 and 1990, approximately 73 percent were taken from Admiralty, Baranof, and Chichagof Islands (including adjacent smaller islands) (this is ADF&G Game Management Unit (GMU) 4). Another 18 percent came from Prince of Wales Island and adjacent islands (GMU 2). Only one percent of the deer harvest occurred in the central portion of the Tongass (GMU 3 - including Kuiu, Kupreanof, Mitkof, Zarembo, Etolin, and Wrangell Islands); however, much of that area was closed to deer hunting during the 1980's. The other eight percent of the deer harvest occurred on the mainland (GMU 1). Total annual deer harvest has remained stable in GMU 4 since 1987, but has increased over the same period in GMU's 1, 2 and 3.

The number of deer hunters increased with the number of deer killed, from 5,110 in 1980 to 10,147 in 1987. In 1990 there were 8,449 deer hunters. Although it varies from year to year, the average success rate for deer hunting from 1980 to 1990 was about 1.6 deer per hunter. In 1987-88, the Alaska Department of Fish and Game conducted a survey within Southeast Alaska, asking deer hunters how many deer they desired to harvest (annually). The average from this survey was 4.2 deer. They were also asked how many deer they would be satisfied with. Here the average was 2.7 deer.

It has been estimated that a deer population at carrying capacity could support an annual harvest (i.e., kill) by hunters of up to about 10 percent of that carrying capacity, with the population remaining stable and hunter satisfaction (success/effort) remaining fairly high (Flynn and Suring 1993). Approaching 20 percent of carrying capacity, hunter satisfaction may diminish, and the harvest may be unsustainable over time. Deer harvest data is collected by the Alaska Department of Fish and Game, using a geographic division called the Wildlife Analysis Area (WAA). There are approximately 190 WAA's covering the Tongass; their boundaries are displayed on the "Community Deer Harvest" map in the map packet. Comparing the average deer harvest by WAA over the last eight years with current estimates of deer habitat capability by WAA (using the new deer model discussed under Environmental Consequences), there are at present 10 WAA's where the average deer harvest exceeds 20 percent of 1995 habitat capability, and another 19 WAA's where average harvest is between 10 and 20 percent (Iverson 1996).

All 10 WAA's with deer harvests exceeding 20 percent are in the northern portion of the Tongass: 4 in the vicinity of Sitka on west Baranof Island, 2 on Chichagof Island (near Pelican and Hoonah), and 4 in the Juneau vicinity (Mansfield Peninsula, and Douglas, Lincoln and Shelter Islands). In these areas deer habitat capability is relatively low due to heavy winter snow accumulations, and hunting pressure is relatively high. Of the 19 WAA's in the 10-20 percent deer harvest category, another 2 are on west Baranof Island, and another 9 on Chichagof Island. The other 8 are located further south, 1 near Wrangell (Woronkofski Island), 1 around Ketchikan, 5 on northern Prince of Wales Island, and one near Hydaburg (Long Island). In these southern areas, habitat capability is relatively low due to past timber harvesting, and hunting pressure again relatively high (due both to the proximity to communities, and the extensive road system on north Prince of Wales Island). It is these areas that are most likely to experience future trade-offs between maintaining high deer harvest levels and allowing activities that may adversely affect habitat capability.

Environmental Consequences

Introduction

The 1991 SDEIS divided the discussion of environmental consequences (effects) to wildlife basically into three parts: wildlife viability, effects on each management indicator species, and hunter demand. The Revised Supplement will take a different approach. Habitat capability estimates by alternative are projected for deer only, using a new model as discussed below. Thus specific estimates of habitat capabilities for each MIS are not possible.

The management indicator species approach has potential problems. It is based on the known (or estimated) requirements of only a few wildlife species, and although for the Tongass these all have varying needs related to old-growth forest, there is no assurance that all or even most other old-growth associated species have similar needs or are adequately represented. Even our knowledge of some of the MIS is scanty. There is an even more fundamental concern. Our knowledge of the specific viability requirements of most Tongass wildlife species is limited. We do know that the old-growth forest ecosystem is the dominant forest system in Southeast Alaska and provides habitat for most of these species. Therefore, an analysis that focuses primarily on the old-growth ecosystem is likely to better address or capture the requirements of all the old-growth associated species. This latter analysis is often called the "coarse filter" approach, as contrasted to the "fine filter" analysis of individual species. The coarse filter, old-growth ecosystem, approach is discussed in the section on Biodiversity.

Apart from the MIS, however, there are several species - some MIS, some not - that have been identified as species of special management concern, and for which a fine filter analysis is still necessary. As discussed under Affected Environment, these include two species recently evaluated for possible Endangered Species Act listing (Alexander Archipelago wolf and northern goshawk), one species that is listed in its range outside of Alaska (marbled murrelet), the most important wildlife species for consumptive use (Sitka black-tailed deer, also important as the principal prey for the wolf), and two other species important as habitat indicators and for consumptive uses (brown bear and marten). These six species will each be evaluated individually. The group of species consisting of all other terrestrial mammals inhabiting the Tongass will also be evaluated as an individual unit.

The hunter demand effects analysis in the 1991 SDEIS has not been redone for the Revised Supplement. However, an analysis of huntable populations of Sitka black-tailed deer is included, and as a part of the demand for subsistence resources, deer supply and demand is discussed in the community-by-community effects sections.

Direct, Indirect and Cumulative Effects

In order to accomplish the wildlife analyses, the Revised Supplement is relying in part upon panels of experts to evaluate the alternatives in terms of the estimated relative risks to the species or habitat of concern. Eight "panel assessments" were conducted, one each for the six species listed above, one for "other terrestrial mammals," and one for the old-growth ecosystem. (A ninth panel assessment, of risk to fish habitat, is discussed in the Fish section.) The old-growth ecosystem panel results are included in the Biodiversity section, and the other seven are included here. These panel assessments provide important information for the effects analysis for Wildlife, but they are not the only information. The Revision interdisciplinary team used the panel results along with other information for estimating the effects of the alternatives. Sitka black-tailed deer (which is not in itself a viability concern) effects will be discussed first, followed by the other focus species under "Species Viability."

Many of the MIS discussed under Affected Environment, as well as the other species of concern, are covered by standards and guidelines in the Proposed Revised Forest Plan (Chapter 4, Wildlife Forest-wide standards and guidelines). These are designed to reduce, minimize or avoid adverse effects potentially occurring at the project level. For several of the MIS, a Forest-wide analysis based on general habitat changes can not provide enough detail or "fine-tuning" to reliably predict alternative consequences. However, the species-specific standards and guidelines can be relied upon to maintain the habitat features and other factors necessary for these species. The 1991 SDEIS discusses many of these species-specific habitat needs incorporated into the standards and guidelines. Thus an analysis combining estimates of old-growth effects at a more general level, with the reliance on standards and guidelines to address project-level effects, is used. For most old-growth-associated species not specifically assessed here it can be assumed that, to the extent that functional and inter-connected old-growth ecosystems are maintained, the various specific habitats within them important to these species will also be maintained.

Sitka Black-tailed Deer: Model and Effects

Deer Habitat Capability Model

The deer panel took a different approach than the other species panels, choosing to develop a systematic process for evaluating landscapes for deer habitat capability rather than doing the actual evaluation of landscapes for each alternative. The panel thus focused on habitat capability modeling for Sitka black-tailed deer. The model is used below to estimate the effects on deer habitat.

Old-growth forest types and their division into volume classes are discussed in the Biodiversity section of this chapter. The panel evaluated these old-growth types and also younger-growth types for their general capability as deer habitat. Deer habitat considerations are listed below. The panel also used existing snow accumlation, elevation, and aspect information.

Higher Volume Old-growth Forest. (See Biodiversity section for definitions and general descriptions of this and the other old-growth types.) Canopy cover is 65-95 percent, with western hemlock dominating most sites. Stands are typically uneven-aged with small gaps in the overhead canopy. Understory (forage) production is moderate, but snow interception is high, making forage more readily available during winter than in other areas. Winter thermal cover is good.

Middle Volume Old-growth Forest. Compared to the higher volume habitat type, these stands have shorter trees (under 100 feet) and a more open canopy (40-75 percent). The stands are uneven-aged, with numerous gaps in the overhead canopy. The more open canopy results in a more abundant understory, but forage is subject to burial by deep snow in winter, and forage availability may be strongly influenced by snow depth. Thermal cover is moderate.

Low Volume Old Growth Forest. The overstory is relatively open, with a 20-50 percent canopy cover and tree height typically less than 60 feet. The understory is very brushy, with lower forage production. Snow interception is low, and thermal cover poor.

Other Forest Lands. Although many of these stands may be described as old-growth forest, the trees are typically small and stunted (under 40 feet), and canopy cover is 10-40 percent. Understory plants are relatively low in digestible protein, and may lose a higher percentage of their leaves over fall and winter. Snow interception in these stands is very low, thermal cover poor.

Even-aged Harvest Young Growth. These are second-growth stands under 25 years in age. Canopy cover during this stage is effectively zero. For the first 15 years, clearcuts produce an abundance of forage in the form of forbs, ferns, half-shrubs, and shrubs, and total understory biomass may be 10-15 times greater than in old growth. After 15 years, shrubs and conifers dominate most sites, causing a reduction in herb-layer plants. At age 25-30, conifers completely dominate most sites and most forage has been, or soon will be, shaded out. Excessive slash may inhibit understory growth and deer access in some areas during the first 5-10 years after logging. Plants growing in clearcuts during the first 25 years are relatively low in digestible protein. Thermal cover is relatively poor.

"Older" Young Growth. These are stands 25-100 years in age, most of them a result of previous clearcut logging. The trees are even-aged, and the canopy is closed (greater than 90 percent canopy cover). Understory production is very low, typically less than 1/10th that of a productive old-growth stand. The limited understory of most older young-growth stands is dominated by mosses and ferns, with shrubs and forbs largely absent. Thermal cover and snow interception are generally good, although deep, wet snows can cause the branches of young-growth trees to deflect, with the snow then being deposited on the forest floor.

Other Post-harvest Types. Some of the alternatives replace traditional clearcut harvest with two-aged and uneven-aged timber harvest systems. These types of harvesting, especially uneven-aged systems such as group selection, have been little used in the Tongass, and have not been studied with respect to deer. For the panel assessment, group selection that would allow 10 percent of a 100-acre patch to be harvested in any 50-year period was assumed. Group selection patches would average one acre with a maximum of two acres. In the short-term, these small openings would produce abundant forage for deer and be interspersed within a stand of residual old growth. In the long-term, such a stand would take on the characteristics of a multi-aged stand with numerous small pockets of like-aged trees ranging in age from very young growth to 500 years.

The panelists evaluated these vegetation types for three snow levels, three elevation zones, and four aspects for suitability as deer winter range. The effect of wolves at the three snow levels was also estimated. Independent of the panelists themselves, the deer resource specialist and the facilitator also scored the habitat types, and a final model was developed by averaging all scores. The final model turned out to be very similar to the deer habitat capability model (Suring 1993) used in previous Forest Plan Revision analyses. Notable differences in the new model over the old model include:

1. Incorporation of a new forest-type stratification scheme (as presented above and discussed in the Biodiversity section);

2. Use of habitat coefficients for group selection harvest;

3. Assignment of higher coefficients to young growth less than 25 years old in low snow areas; and

4. A simplified model with fewer variables.

The model assigns the highest habitat capability scores (for deer winter habitat) to the higher-volume old-growth stands on south-facing slopes at lower elevations within watersheds that have a low propensity for deep snow winters. Recent clearcuts in the shrub-sapling stage received fairly high habitat capability scores in low and intermediate snow-level areas (such as Prince of Wales Island in the southern portion of the Tongass), but low scores in high snow areas (such as the mainland). In general, the more open stand types are more adversely affected by higher snow levels.

Other than non-forested areas, the lowest habitat capability scores are assigned to the older second-growth stands (the stem-exclusion phase) that have shaded out the understory forage. Where group selection is applied, the model predicts habitat scores between higher and middle volume old growth; however, these average scores had some of the largest variances. There was uncertainty among the panelists on how this practice would actually affect deer habitat values.

To transform the habitat scores into "numbers" of deer (for planning purposes only), carrying capacity was estimated based on long-term deer density information, point-in-time estimates of deer density, and nutritional considerations (Alaska Department of Fish and Game, unpublished information). These suggested that a habitat with a score of 100 could support 75-100 deer per square mile. To be conservative, 75 deer per square mile was used as the carrying capacity for optimum deer habitat.

Deer Effects

This analysis evaluates relative changes in habitat capability and not actual on-the-ground deer numbers, which for any given time period are likely to be below, or occasionally above, the populations estimated by the habitat capability model. Winter severity, hunting pressure, predation pressure, and other variables are beyond the scope of the model. In fact, the primary purpose of this model is not so much to estimate deer habitat capability as to provide a measure for comparing alternatives relative to their potential effects on Sitka black-tailed deer. Alternatives with a greater abundance of habitat features associated with deer habitat capability will rate higher than those that have lesser abundance of these features.

The model results presented here assume the maximum level of timber harvest for each alternative. More specifically, this analysis assumes that: 1) 100 percent of the lands available for timber harvest other than uneven-aged management would be harvested by 2095 (using a 100-year rotation); 2) 60 percent of the lands availiable for extended roation harvest would be harvested by 2095 (using a 200-year "rotation"); 3) 25 percent of the young growth would be in the stand initiation phase (25 years old or younger) and 75 percent would be in the stem exclusion phase (26-100 years old) by 2095.

Under even-aged and two-aged harvest systems, the amount of habitat capability reduction over the 100-year analysis period is directly related to the amount of timber harvest. While the short-term (10-15 year) effect of a timber harvest will vary with average seasonal snow accumulation (since higher accumulations reduce forage availability), the longer-term (100 year) effect depends only on the amount of area harvested, since forage species will have been shaded out by the vigorously growing hemlock and spruce forest. Under uneven-aged systems (such as group selection), available forage within any given area will be maintained for a longer time, as will adjacent thermal cover. However, in areas with lower snowfall and limited forage, even-aged or two-aged systems may be better for deer winter habitat by keeping more of the landscape in the early serial stages, producing more available forage.

Table 3-89 displays the proportion of the existing (1995) estimated habitat capability that would still be remaining in 2095 under each alternative. This is shown for each Wildlife Analysis Area (WAA), land divisions used by the Alaska Department of Fish and Game and used for deer inventories and planning. Forest-wide, the alternatives are estimated to retain from 96 to 76 percent of the current habitat capability in 2095. Ranked from highest to lowest, the alternatives exhibited this pattern: 1, 5, 4, 3, 6, 8, 2, 9 and 7.

Alternative 1 would have little effect on deer habitat capability: the only changes result from existing young-growth stands entering the stem exclusion phase at about 25 years of age. Alternatives 4, 5 and 6 use extended rotation harvest methods and provide the opportunity to maintain or in some cases improve habitat quality while harvesting a modest amount of timber, although this is somewhat offset in Alternative 6 by its use of a shorter stand rotation age. Alternatives 3 and 8 include a full habitat reserve system, which will maintain large old-growth blocks with high deer habitat capability distributed across the Forest. Alternatives 2, 7 and 9 all rely on even-aged management with no system of reserves, and show the greatest reductions in habitat capability.

The table also shows that, at the WAA level, some individual areas under some alternatives lose more than 50 percent of their habitat capability for deer. The effects of these reductions are discussed in the community-by-community subsistence effects analysis elsewhere in this chapter.

Deer hunting in relation to current deer harvests and habitat capabilities was discussed above under Affected Environment. Based on that evaluation, a Forest-wide standard and guideline was developed with the objective of maintaining current opportunities for deer hunting by maintaining deer habitat capability. For WAA's in which the average deer harvest was 20 percent or higher than carrying capacity (as estimated by the deer model), no additional timber harvesting would be permitted so that the existing habitat capability would be retained. For WAA's in which the deer harvest was between 10 and 20 percent of carrying capacity, the most important deer winter range is maintained. This standard and guideline is used for Alternatives 1, 3, 4, 5 and 6. In these alternatives, no further reductions in deer habitat capability are anticipated over the next 10 years. While this may not help satisfy the apparent high demand for deer in these areas, or reduce hunting pressures, opportunties to satisfy that demand will not be reduced by National Forest activities.

TABLE 3-89
Estimated Deer Habitat Capability for Selected WAAs on Tongass National Forest

WAA [2]	Average 8 year harvest	1954 Deer	1995 Deer	alt 1	alt 2	alt 3	alt 4	alt 5	alt 6	alt 7	alt 8	alt 9	Total Acres [1]	Vicinity
				Proportion of Deer Habitat Capability Remaining at 2095										
101	102	1564	1513	1.00	1.00	1.00	1.00	1.00	1.00	0.68	0.87	1.00	38952	Gravina Is.
303	6	1616	1592	1.00	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	46825	Duke Is.
404	9	3359	3359	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	180282	Revilla Is
405	18	2000	1850	0.98	0.80	0.86	0.88	0.88	0.81	0.74	0.84	0.75	53095	Revilla Is
406	87	2742	2409	0.96	0.73	0.82	0.83	0.83	0.74	0.66	0.78	0.68	127166	Revilla Is
407	66	1000	950	0.98	0.67	0.77	0.81	0.81	0.69	0.70	0.79	0.66	41895	Revilla Is
408	39	373	361	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	16667	Revilla Is
509	58	1285	1214	0.99	0.83	0.91	0.89	0.89	0.83	0.70	0.85	0.80	68817	Revilla Is
510	41	2445	1860	0.99	0.72	0.80	0.84	0.84	0.74	0.51	0.70	0.60	154271	Revilla Is
511	0	335	334	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	53258	Revilla Is
612	57	1825	1802	1.00	0.69	0.79	0.82	0.82	0.70	0.64	0.77	0.63	70653	Cleveland
613	104	1447	1405	1.00	0.75	0.86	0.85	0.87	0.79	0.69	0.83	0.71	45412	Cleveland
614	13	463	463	0.95	0.67	0.72	0.79	0.79	0.68	0.66	0.70	0.64	13247	Cleveland
715	4	855	853	1.00	1.00	1.00	1.00	1.00	1.00	0.65	0.83	1.00	101544	Cleveland
716	0	322	322	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	335103	Cleveland
717	1	469	469	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	145861	Misty Fiords
719	1	280	280	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	199656	Misty Fiords
821	2	1179	1179	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	110949	Misty Fiords
822	1	3288	3288	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	390568	Misty Fiords
823	1	2414	2414	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	189136	Misty Fiords
901	38	1958	1940	0.96	0.77	0.85	0.86	0.86	0.78	0.63	0.82	0.62	37184	Sumez Is
902	36	5403	5399	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.98	0.95	106385	Outer Islands
1003	142	3334	2639	0.75	0.59	0.71	0.67	0.67	0.62	0.55	0.70	0.55	44494	Heceta Is.
1105	2	5099	5071	1.00	0.93	0.97	0.97	0.98	0.96	0.60	0.88	0.60	104370	Dall Is
1106	65	388	388	1.00	1.00	1.00	1.00	1.00	1.00	0.65	0.98	0.65	7386	Long Is
1107	40	5804	5703	0.98	0.82	0.91	0.90	0.91	0.86	0.66	0.84	0.66	145775	POW
1108	16	3430	3420	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	85446	POW
1209	6	3311	3311	1.00	0.91	0.96	0.95	0.95	0.92	0.68	0.86	0.68	82253	POW
1210	20	2242	2242	1.00	0.74	0.83	0.86	0.86	0.76	0.55	0.76	0.68	85884	POW
1211	51	1833	1768	0.95	0.74	0.82	0.84	0.84	0.76	0.69	0.80	0.68	41720	POW
1212	24	1077	1073	1.00	0.87	0.90	0.93	0.93	0.88	0.77	0.84	0.74	37424	POW
1213	15	788	781	1.00	0.83	0.88	0.91	0.91	0.85	0.77	0.86	0.78	30003	POW
1214	91	1652	1405	0.96	0.65	0.81	0.79	0.84	0.76	0.62	0.76	0.62	74713	POW
1315	172	3006	2076	0.92	0.72	0.77	0.82	0.83	0.76	0.68	0.76	0.68	59798	POW
1316	72	740	739	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	39688	POW
1317	75	1651	992	0.98	0.73	0.87	0.84	0.89	0.84	0.67	0.81	0.66	61565	POW
1318	323	1276	1213	0.96	0.64	0.71	0.79	0.80	0.69	0.65	0.69	0.63	58023	POW
1319	302	2975	2364	0.94	0.65	0.76	0.80	0.84	0.78	0.58	0.74	0.58	103242	POW
1323	126	1677	1654	0.98	0.81	0.87	0.89	0.90	0.84	0.75	0.85	0.74	38713	POW
1332	65	2306	2104	0.96	0.74	0.82	0.84	0.87	0.80	0.69	0.81	0.66	65521	POW
1420	121	1301	790	0.81	0.68	0.75	0.75	0.77	0.73	0.65	0.72	0.65	42738	POW
1421	242	3010	2442	0.89	0.65	0.76	0.76	0.84	0.80	0.52	0.69	0.58	90410	POW
1422	361	4701	3617	0.71	0.63	0.68	0.69	0.70	0.66	0.54	0.66	0.61	121272	POW
1524	2	649	649	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	11298	Warren
1525	42	3196	2003	0.85	0.66	0.80	0.76	0.80	0.77	0.60	0.77	0.60	41106	Kosciusko Is.
1526	56	2443	2328	0.97	0.92	0.95	0.95	0.95	0.94	0.91	0.94	0.91	66865	POW
1527	37	1632	1383	0.83	0.68	0.74	0.75	0.76	0.72	0.59	0.68	0.59	39344	POW
1528	43	322	247	1.00	0.73	0.92	0.88	0.97	0.94	0.72	0.94	0.74	24548	POW
1529	180	2572	2051	0.86	0.68	0.76	0.76	0.78	0.73	0.62	0.73	0.64	69126	POW
1530	161	2035	1427	0.88	0.75	0.82	0.81	0.83	0.80	0.70	0.79	0.71	59857	POW
1531	35	2898	2262	0.77	0.64	0.70	0.71	0.71	0.66	0.53	0.66	0.53	34289	POW
1601	1	1266	1263	1.00	0.65	0.75	0.80	0.80	0.67	0.59	0.68	0.58	43464	Farragute Bay
1602	5	820	810	1.00	1.00	1.00	1.00	1.00	1.00	0.58	0.99	1.00	139435	Farragute Bay
1603	3	648	607	0.99	0.79	0.94	0.88	0.88	0.81	0.66	0.88	0.71	78659	Thomas Bay
1605	53	944	767	0.96	0.72	0.74	0.82	0.82	0.72	0.66	0.73	0.65	149092	Thomas Bay
1706	21	287	287	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	99140	Leconte Bay
1707	3	940	940	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	79643	Stikine River

WAA [2]	Average 8 year harvest	1954 Deer	1995 Deer	Proportion of Deer Habitat Capability Remaining at 2095									Total Acres [1]	Vicinity
				alt 1	alt 2	alt 3	alt 4	alt 5	alt 6	alt 7	alt 8	alt 9		
1708	0	864	864	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	240891	Stikine River
1810	2	660	660	1.00	0.58	0.67	0.75	0.75	0.58	0.47	0.54	0.52	55392	Back Channel
1811	1	696	688	1.00	0.78	0.88	0.88	0.88	0.80	0.56	0.81	0.62	92705	Back Channel
1812	4	857	852	1.00	0.94	0.96	0.97	0.97	0.95	0.68	0.81	0.87	99444	Bradfield
1813	0	401	288	1.03	0.91	0.93	0.97	0.97	0.92	0.81	0.91	0.91	237510	Bradfield
1814	0	402	397	1.00	0.88	0.90	0.93	0.93	0.89	0.73	0.80	0.85	69427	Bradfield
1815	0	366	337	1.00	0.98	0.99	0.99	0.99	0.98	0.92	0.93	1.00	43795	Cleveland
1816	5	646	597	0.97	0.76	0.81	0.86	0.86	0.78	0.68	0.79	0.68	36333	Cleveland
1817	22	1363	1363	1.00	0.63	0.93	0.79	0.91	0.85	0.57	0.91	0.55	64140	Cleveland
1901	14	3493	3275	0.98	0.68	0.79	0.82	0.82	0.71	0.56	0.75	0.58	132832	Etolin Is
1902	1	305	283	0.96	0.82	0.86	0.89	0.89	0.85	0.51	0.74	0.51	9554	Cleveland
1903	34	2676	2419	0.95	0.67	0.77	0.79	0.79	0.68	0.57	0.71	0.61	119083	Wargell Is.
1904	63	909	607	0.92	0.65	0.74	0.79	0.79	0.70	0.53	0.70	0.44	23113	Woronkoski
1905	74	3094	2582	0.91	0.62	0.71	0.74	0.74	0.63	0.59	0.69	0.59	117584	Zarembo Is.
1906	23	942	863	0.78	0.75	0.76	0.77	0.77	0.76	0.50	0.70	0.49	11376	Shruby Is.
1910	38	3222	3148	1.00	0.96	0.97	0.98	0.98	0.96	0.94	0.96	0.94	102222	Etolin Is.
2007	195	3103	2534	0.92	0.67	0.71	0.77	0.79	0.70	0.61	0.69	0.61	113403	Mitkof Is
2008	3	347	344	1.00	0.66	0.72	0.82	0.82	0.70	0.60	0.72	0.57	10636	Woewodski
2202	8	140	140	1.00	1.00	1.00	1.00	1.00	1.00	0.61	0.74	0.61	49374	Lynn Canal
2305	5	248	248	1.00	0.63	0.96	0.80	0.80	0.67	0.53	0.96	0.53	102183	Lynn Canal
2306	4	158	145	1.00	0.46	0.76	0.72	0.72	0.53	0.38	0.75	0.38	58598	Cross Sound
2408	0	61	61	1.00	0.57	0.59	0.75	0.75	0.59	0.57	0.59	1.00	19213	
2409	0	168	167	1.00	0.66	0.68	0.80	0.80	0.67	0.61	0.68	1.00	17579	
2514	0	311	311	1.00	0.78	0.88	0.88	0.88	0.79	0.76	0.88	0.74	37393	Juneau
2515	0	364	364	0.99	0.99	0.99	0.99	0.99	0.99	0.91	0.97	0.99	100456	Juneau
2517	14	150	150	1.00	0.93	1.00	0.96	0.96	0.93	0.90	1.00	0.90	76336	Juneau
2620	20	77	76	1.00	1.00	1.00	1.00	1.00	1.00	0.57	0.89	1.00	2560	N. Shelter
2621	72	163	163	1.00	1.00	1.00	1.00	1.00	1.00	0.56	0.69	1.00	3750	Shelter Is.
2722	375	815	813	1.00	0.98	1.00	1.00	1.00	1.00	0.78	0.90	1.00	29529	Douglas Is
2823	4	186	186	1.00	0.68	0.77	0.83	0.83	0.72	0.55	0.69	0.61	410930	Whiting River
2824	2		0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	295473	Tracy Arm
2825	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	304900	Endiott
2926	7	445	438	1.00	0.61	0.65	0.78	0.78	0.63	0.50	0.63	0.50	131967	Hobart Bay
2927	2	368	367	1.00	0.58	0.69	0.76	0.76	0.60	0.51	0.65	0.48	148422	Port Houghton
3001	723	3420	2996	0.98	0.82	0.98	0.98	0.98	0.98	0.96	0.97	0.71	81361	
3002	566	1067	807	0.94	0.86	0.94	0.94	0.94	0.94	0.77	0.86	0.81	80263	
3003	341	1381	1381	0.93	0.79	0.92	0.85	0.85	0.80	0.69	0.92	0.66	60222	
3104	260	3130	2809	0.88	0.69	0.81	0.81	0.81	0.77	0.79	0.81	0.66	55451	Kruzof Is
3105	157	1949	1939	1.00	0.98	1.00	0.99	0.99	0.98	0.88	0.97	0.88	53198	Kruzof Is
3206	143	939	939	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	44395	Baranof Is
3207	129	782	782	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	100161	Baranof Is
3308	201	4150	3164	0.89	0.65	0.71	0.75	0.75	0.66	0.57	0.69	0.57	108946	Baranof Is
3309	152	1001	978	1.00	0.89	0.90	0.93	0.93	0.89	0.85	0.87	0.85	49424	Chichagof Is
3310	245	1442	1331	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	71588	Chichagof Is
3311	295	1532	1496	1.00	0.81	0.84	0.89	0.89	0.82	0.72	0.80	0.76	56224	Chichagof Is
3312	141	438	410	1.00	0.78	0.88	0.87	0.87	0.78	0.69	0.87	0.76	20654	Baranof Is
3313	131	2135	1508	0.81	0.63	0.70	0.78	0.78	0.64	0.58	0.66	0.58	74143	Baranof Is
3314	135	998	877	1.00	0.69	0.99	0.81	0.81	0.69	0.63	0.98	0.66	41827	
3315	127	1392	1284	0.97	0.72	0.91	0.83	0.83	0.73	0.59	0.90	0.69	43994	
3416	191	1690	1690	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	64812	Chichagof Is
3417	222	2644	2644	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	137909	Chichagof Is
3418	110	1744	1744	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	48478	Chichagof Is
3419	93	397	397	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	64869	Chichagof Is
3420	94	471	471	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	54028	Chichagof Is
3421	86	790	790	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	43300	
3523	169	1346	1169	0.94	0.66	0.81	0.77	0.85	0.79	0.63	0.80	0.60	49623	NE Chichagof
3524	208	211	211	1.00	0.55	0.55	0.73	0.73	0.55	0.54	0.58	0.54	15524	NE Chichagof
3525	210	2441	2034	0.92	0.58	0.68	0.74	0.76	0.64	0.53	0.67	0.57	73679	NE Chichagof
3526	191	1394	1180	0.95	0.66	0.80	0.81	0.85	0.79	0.59	0.80	0.60	41048	NE Chichagof
3551	225	1846	1618	0.94	0.58	0.72	0.74	0.79	0.70	0.54	0.71	0.52	58338	NE Chichagof
3627	71	988	813	0.92	0.66	0.76	0.77	0.77	0.67	0.64	0.75	0.64	27295	Chichagof Is
3628	31	1042	1024	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	34220	Chichagof Is
3629	161	1830	1706	0.98	0.68	0.77	0.81	0.81	0.69	0.61	0.73	0.72	98178	Chichagof Is

WAA [2]	Average 8 year harvest	1954 Deer	1995 Deer	Proportion of Deer Habitat Capability Remaining at 2095									Total Acres [1]	Vicinity
				alt 1	alt 2	alt 3	alt 4	alt 5	alt 6	alt 7	alt 8	alt 9		
3630	37	473	468	1.00	0.69	0.72	0.82	0.82	0.69	0.55	0.69	0.69	70736	Chichagof Is
3731	150	1291	1235	0.97	0.83	0.97	0.90	0.90	0.86	0.69	0.97	0.63	98751	Chichagof Is
3732	27	278	278	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	72061	Chichagof Is
3733	121	1813	1813	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	215555	Baranof
3734	120	2057	2057	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	126120	Baranof
3835	319	907	907	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.69	33033	Admiralty
3836	341	1592	1592	1.00	1.00	1.00	1.00	1.00	1.00	0.72	0.79	0.66	54569	Admiralty
3837	76	1131	1131	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	59128	Admiralty
3938	267	3239	3239	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	76664	Admiralty
3939	297	2976	2976	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	66131	Admiralty
3940	244	2670	2670	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	67845	Admiralty
4041	75	2110	2110	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	54823	Admiralty
4042	107	2608	2608	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	52403	Admiralty
4043	78	1854	1854	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	111609	Admiralty
4044	211	1264	1264	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	69322	Admiralty
4054	47	2222	2222	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	66454	Admiralty
4055	77	2565	2565	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	67997	Admiralty
4145	159	1288	1288	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	65100	Admiralty
4146	158	907	907	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	65443	Admiralty
4147	194	1007	1007	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	44194	Admiralty
4148	162	1686	1686	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	36766	Admiralty
4149	141	1388	1388	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	36573	Admiralty
4150	228	953	953	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	22790	Admiralty
4222	170	2065	2021	0.99	0.80	0.85	0.88	0.88	0.80	0.79	0.84	0.79	89755	
4252	206	477	477	1.00	0.65	0.80	0.79	0.79	0.65	0.63	0.78	0.63	21869	
4253	123	1191	1042	0.95	0.67	0.79	0.80	0.80	0.69	0.70	0.87	0.57	46862	
4256	66	781	781	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	18837	Pleasent Is
5012	14	5687	4736	0.83	0.63	0.69	0.76	0.76	0.66	0.51	0.65	0.50	147820	Kiui Is
5013	0	2289	2192	0.99	0.81	0.84	0.89	0.89	0.82	0.46	0.67	0.76	63271	Kiui Is
5014	1	2278	2214	1.00	0.66	0.73	0.80	0.80	0.67	0.57	0.66	0.57	40093	Kiui Is
5015	0	1191	1191	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	19084	Coronation
5016	0	3162	3127	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99	1.00	69278	Kiui Is
5017	0	6627	6535	1.00	0.85	0.89	0.92	0.92	0.87	0.80	0.87	0.81	124105	Kiui Is
5018	3	1637	1559	0.98	0.82	0.84	0.89	0.89	0.82	0.54	0.75	0.82	49217	Kiui Is
5130	11	2606	2576	1.00	0.77	0.80	0.87	0.88	0.80	0.67	0.80	0.78	92637	Kupreanof
5131	25	1247	1133	0.92	0.84	0.86	0.90	0.91	0.86	0.59	0.83	0.85	70472	Kupreanof
5132	56	1088	856	0.76	0.70	0.72	0.79	0.79	0.71	0.64	0.71	0.63	38610	Kupreanof
5133	21	1507	1483	1.00	0.67	0.72	0.81	0.83	0.72	0.60	0.70	0.61	107769	Kupreanof
5134	45	3280	3005	0.96	0.81	0.83	0.88	0.88	0.82	0.78	0.80	0.78	102411	Kupreanof
5135	0	805	804	1.00	0.77	0.85	0.86	0.89	0.82	0.76	0.82	0.76	55323	Kupreanof
5136	10	1084	944	0.85	0.61	0.66	0.77	0.77	0.63	0.58	0.63	0.57	59816	Kupreanof
5137	0	535	516	1.00	0.98	0.98	0.99	0.99	0.98	0.98	0.98	1.00	49570	Kupreanof
5138	47	1659	1507	0.95	0.61	0.69	0.75	0.78	0.67	0.55	0.65	0.55	60884	Kupreanof
Total	14892	260941	240912	0.96	0.83	0.88	0.89	0.90	0.86	0.76	0.85	0.78	12966235	

(1) all National Forest lands, including lakes, rock, ice, and high elevation alpine.
(2) The following WAAs have been omited due to low deer densites: 718, 820, 824, 825, 826, 1604, 1809, 2410, 2411, 2412, 2413, 2516, 2518, 2519, 2824, 2825, 4302-4607

Wildlife Species Viability

Evaluating Viability

The National Forest Management Act (NFMA) requires that the Forest Service provide for the diversity of plants and animals, based upon the suitability and capability of each National Forest, as a part of meeting overall multiple-use objectives (16 USC 1604(g)(3)(B)). The NFMA implementing regulations define diversity as "the distribution and abundance of different plant and animal communities and species within the area covered by a [forest plan]" (219.3). In addition to providing diversity direction (at 219.26), the NFMA regulations include the following requirements for managing habitat to maintain viable populations of wildlife species:

> Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area. (36 CFR 219.3)

Quantitative criteria for viability (or diversity) are not specified by either the Act of the regulations. The Forest Ecosystem Management Assessment Team defined viability as "the likelihood of a species persisting well distributed throughout its range [for] a century or longer" (FEMAT, 1993, p II-99). For the Tongass, the evaluation of viability includes consideration of its unique island archipelago environment as well as current scientific thinking on population viability and conservation biology, as found in the general literature and the recent Tongass-specific assessments. Further discussion follows for two key terms: "well distributed" and "continued existence."

Well Distributed. The phrase "well distributed in the planning area" is used in the regulations. The planning area, for the Tongass Forest Plan and for the purposes of viability analysis, includes all National Forest land within the boundaries of the Tongass. The NFMA Regulations provide that habitat must be "well distributed" so that "individuals can interact with others in the planning area." Interaction is the key operative word, because different individual species often exhibit widely different movement and dispersal capabilities. The continued existence of a population within which interaction between individuals becomes difficult (significantly less frequent) or impossible may no longer be well distributed. The fragmentation of habitats, which isolates and creates small insular populations, contributes to decreased population distribution and increased likelihood of local extirpation (Wilcove et al. 1986).

In the island archipelago and naturally fragmented landscapes of Southeast Alaska, natural interaction is often problematic, especially for species that cannot move between islands. The insular distribution patterns of over 70 terrestrial mammal species among individual islands illustrates these dispersal limitations. MacDonald and Cook (1994) reported that 27 mammal taxa were endemic to Southeast Alaska. Southeast Alaska most likely supports ecotypes and locally adapted species on individual islands, especially the less mobile species such as small mammals, amphibians, and many invertebrates, but such relationships have not been thoroughly investigated or described. Maintaining populations across the full range of environmental conditions over which they occur retains the genetic variability that is necessary for evolution and adaptation to environmental change (Lande and Barrowclough 1987). At a broad geographic scale, environmental variability (for the Tongass) is classified into Biogeographic Provinces that exhibit differences in climate, geology, and species distributions (see Biodiversity section). For wide-ranging species (i.e., northern goshawk, brown bear), well distributed populations are appropriately assessed between, and within, these provinces across the Forest. For many other species, the appropriate scale will be finer, down to small individual islands within a province (i.e., Coronation Island vole).

Continued Existence. Time scale is a critical component for evaluating the potential effects of Forest Plan alternatives on wildlife viability. The short-term, 10-15 year planning period is an inadequate scale for conducting a viability analysis, which must consider long-term, cumulative changes and consequences. There are many reasons for this. The processes of evolution, speciation, and natural extinctions occur over thousands to millions of years; even when accelerated by human activity, extinction or endangerment can require many decades if not centuries (Wilson 1988). One decade is merely a blink in evolutionary time, over which little detectable effect may occur. A species population is not likely to noticeably react in such a short time, but actions taken during a planning period, in combination with past and projected future actions, may be critical in affecting a forest's ability to maintain long-term population viability. And any changes occurring that could measurably affect viability within a 10-15 year period are not likely to be detected with currently available monitoring and evaluation techniques.

Therefore, the viability analysis, including the species assessments, used a 100-year time period, or planning horizon, which is probably the minimum period over which viability can be evaluated: the scientific literature suggests 100-1,000 years (Shaffer 1981, Soule and Wilcox 1980, Shaffer 1987, FEMAT 1993). One hundred years is the average rotation age under even-aged management, and thus the time period over which old-growth stand characteristics will be significantly affected. Forests managed under a 100-year rotation will continue to cycle through the stem exclusion phases of stand development, the least favorable phase for old-growth associated species and a permanent change in forest structure (see Biodiversity section for a fuller discussion). Such changes in forest stand structure and wildlife habitat capability require a commensurate period of time over which to assess the cumulative effects to viability.

Species Assessments

The viability analysis relies on the six wildlife species panel assessments mentioned previously (wolf, marten, northern goshawk, brown bear, marbled murrelet, and "other mammals"). Each of these panel assessments were conducted by scientists with expert professional knowledge and experience of the species being evaluated. The general process used for these panel assessments is described in the Introduction to this chapter. The five outcomes used for each of the viability panels are described below. Table 3-90 summarizes the definitions.

Outcome I. Habitat is of sufficient quality, distribution, and abundance to allow the species to maintain well distributed, breeding populations across the Tongass National Forest. The concept of well distributed must be based on knowledge of the species distributional range, and life history.

Outcome II. Habitat is of sufficient quality, distribution, and abundance to allow the species to maintain breeding populations distributed across the Tongass National Forest. However, some local populations are more ephemeral because of reduced population levels and increased susceptibility to environmental extremes and stochastic (random) events associated with reduced habitat abundance and distribution. Vacated habitats may become recolonized in the future.

Outcome III. Habitat is of sufficient quality, distribution, and abundance to allow the species to maintain some breeding populations, but with significant gaps in the historic distribution on the forest. These gaps are likely permanent and will result in some limitation of interactions among local populations. The significance of gaps must be judged relative to the species distributional range, and life history.

Outcome IV. Habitat only allows continued species existence in refugia, with strong limitations on interactions among local populations. The significance of extirpations across islands or regional landscapes must be evaluated relative to the species distribution, range, and life history.

Outcome V. Habitat conditions result in species extirpation from federal land.

Table 3-90
Summary of Outcomes for Wildlife Species Viability

Outcome	Species Presence	Distribution	Population Interactions
I	Yes	Similar to historic range	Yes
II	Yes	Low density populations; temporary gaps may occur	Possible limitations
III	Yes	Permanent gaps likely	Some limitations
IV	Yes	Only in refugia	Severely restricted
V	Extirpated	na	na

Following are discussions of each of the six panels, including panel assessment results and additional effects considerations. Fuller summaries for each panel, and detailed notes of each panel assessment meeting, are contained in the planning record.

Northern Goshawk

Considerations and Assumptions. Panelists noted the apparent low relative density of nesting goshawks in Southeast Alaska. Less than 40 total nest sites have been identified after nearly 5 years of inventory effort across the Forest. Low prey diversity compared to other goshawk populations across North America was considered a principle factor, resulting in a higher sensitivity to habitat modifications which would reduce prey diversity and abundance.

Locally-obtained biological information on goshawk indicates a significant preference for productive old growth forest, the general avoidance of all other habitat types (especially early and mid-seral conifer forests), and a predominant use of lower elevations (less than 1200') and relatively gentle slopes (less than 35%). This disproportionate use of productive old growth, at low elevations on gentle slopes, indicated to panelists that not all old-growth forest acres were of equal value to goshawks. Most timber harvest also occurs in these situations, thus causing elevated concern among panelists of a disproportionate effect of planned harvest on goshawk habitat suitability, a feature not revealed in overall statistics of net old growth acres harvested.

Riparian, beach and estuary features were considered important landscape components, and their maintenance or protection incrementally contributed to enhanced confidence that an alternative would maintain suitable habitat to support well-distributed goshawk populations. Information to date suggests that goshawks select these landscapes when productive old-growth stand structure is present. Riparian, beach and estuary habitats generally support greater prey diversity and net prey productivity, features important to goshawk habitat quality.

Discussion revealed that a principal rating component was the net proportion of all old growth on the Tongass that would be harvested under each alternative. This surrogate was used in lieu of detailed evaluations, uncertainty about what specific old growth acres would be harvested, and limited knowledge about goshawks in Southeast Alaska. These general proportions were compared to existing percentage of young growth conifer forest in local areas of the Tongass and related goshawk status. Most notable was north Prince of Wales Island where in excess of 20 percent of the productive old growth had been harvested. Significant concern arose over this and increased proportions of unsuitable early seral forest on the landscape. This concern was generated from the relatively low density of nesting goshawks discovered relative to the inventory effort in those landscapes. In addition, potential signs of ecological stress was evidenced by large home ranges, nonbreeding, and differential winter and breeding use areas. Thus, qualitative judgments concluded that alternatives resulting in this or a greater percentage of the net productive old growth harvested could result in negative overall landscape consequences to sustaining resilient, adaptable, and well distributed goshawk populations in Southeast Alaska.

The concept of extended rotations was viewed favorably by panelists. Maintenance of regenerating conifer stands in mid to late seral stand structure from 100 to 200 years was believed to supply adequate stand structure for prey production and goshawk foraging opportunities. However, given the 100-year limit on the panel analysis, the practical benefit from extended rotations was confined to a reduced net harvest of productive old growth forests.

The concept of habitat reserves was seen as a less important landscape design feature, since management of the landscape matrix as a whole was felt to have a greater net influence on goshawk habitat suitability, distribution and persistence. Large and medium habitat reserves as proposed were generally considered too small to sustain more than one or two pairs of goshawks. Roads were not considered an adverse element, thus roadless features of reserves did not generally contribute to overall habitat suitability. Finally, some relatively low level of forest management was not considered adverse to overall goshawk habitat suitability, and could contribute to stand diversity, but the thresholds of net landscape composition of early seral forests were also considered to be relatively low.

Evaluation of Alternatives. The final average panel ratings for northern goshawk are displayed in Table 3-91. Alternative 1 essentially represents a no-harvest alternative. Nearly 2/3's of all likelihood points were assigned to Outcome I, that well distributed goshawk breeding populations would be maintained across the Tongass. However, Outcome II received nearly a third of likelihood scores, suggesting that even with no further reduction in old growth forest, goshawk populations will likely experience reductions and local persistence may be more ephemeral or irregular as a result of the local concentration of habitat loss from past timber harvest. Implied in this conclusion is that additional harvest will be additive to an existing effect.

Table 3-91
Average Panel Assessment Ratings: Northern Goshawk

Outcome	Alternative								
	1	2	3	4	5	6	7	8	9
1	66	0	17	23	23	6	0	0	0
2	31	24	35	42	51	44	12	27	23
3	3	40	34	29	25	33	40	41	42
4	0	32	14	6	1	17	40	29	32
5	0	4	0	0	0	0	8	3	3

Because of the significant amount of legislatively reserved lands and the net amount of productive old growth that will likely remain under even the most aggressive timber harvest alternatives, panelists believed there was little chance for total extirpation of the goshawk population from Southeast Alaska. The highest rating for Outcome V (extirpation) was only 8 (for Alternative 7). However, persistence of a few breeding pairs does not represent a well distributed goshawk population across the planning area.

Moderately-high net scores for Outcomes I and II occurred for Alternatives 4 and 5 (74 and 65, respectively). These alternatives have in common the use of extended 200-year rotations. Panelists generally believed that forest structure resulting from mid-seral mature forest developmental stages (100-200 years old) was more beneficial to goshawks and their prey than a combination of reserves and shorter, 100-year rotations.

Alternatives 3 and 6 had intermediate combined Outcome I and II scores of 52 and 50, respectively. In spite of partial or complete application of habitat reserves, the 100-year rotation perpetuated a less suitable early seral forest stand structure and was a drawback for these alternatives. Conversely, panelists attributed moderate uncertainty that either of these 2 alternatives would maintain well distributed populations, with a combined score of outcomes III, IV and V of 48 (Alt 3) and 50 (Alt 6). This suggests that there may be nearly an even chance that either permanent gaps in the distribution will occur or goshawks may exist only in refugia under these 2 alternatives in 100 years; and in either case interaction between individuals would likely diminish.

Alternatives 2, 7, 8 and 9 were rated by panelists as having a relatively high likelihood (76, 88, 73, and 78, respectively) that in 100 years gaps in distribution would be likely to occur or populations would exist only in isolated refugia (Outcomes III or IV). Both outcomes project limitations or restriction in interaction between individuals within the population. Alternative 8 rated least (73) among the four by virtue of a forestwide system of habitat reserves. However, reserves alone imbedded in a matrix of early seral forest structure managed on a 100-year rotation were rated by the panelists to be of insufficient size to support goshawk populations without gaps in distribution or refugia populations occurring.

Commentary on the Panel Ratings. The likelihood that alternatives will sustain habitat to support viable goshawk populations well distributed across the Tongass in 100 years is examined relative to a detailed analysis contained in the interagency Goshawk Conservation Assessment (Hayward et al. 1995). A fundamental conclusion in the conservation assessment was the significant goshawk use of productive old growth forests and little use or avoidance of all other available habitat types. This relationship formed the foundation of a finding that landscapes managed under a 300 year timber harvest rotation would provide the combination of forest age classes to provide a high likelihood of sustaining viable goshawk populations. These age classes were 1/3 of the landscape in 0-100 year old stands (low value to goshawks), 1/3 in 100-200 (moderate value to goshawks) year old stands, and 1/3 in 200-300 or older stands (higher values to goshawks). The Conservation Assessment concluded that habitat reserves were necessary in addition to extended rotations in regions where accelerated past timber harvest precluded the opportunity to meet this age class distribution.

While the conservation assessment examined a full 300 year rotation applied to all productive old growth forests across the landscape, the extended rotation feature of some alternatives uses a 200 year silvicultural rotation. These are fundamentally equal since nearly 40% of the productive old growth used by goshawks is unsuitable for timber harvest and would be continually present; an amount exceeding the 33% necessary to achieve a 300 year rotation as conceived in the conservation assessment. Placing the remainder of the productive old growth under a 200 year rotation is consistent with a full 300 year rotation.

Apart from Alternative 1, Alternative 5 has the highest likelihood of sustaining well distributed goshawk populations within 100 years with a 200 year extended rotation in combination with reserves in some provinces to compensate for past harvest. This was the ideal conceptual conservation strategy identified in the Goshawk Conservation Assessment. Alternative 4 applies a 200 year rotation forestwide and would theoretically provide the necessary distribution of forest age classes to sustain goshawks. However, it does not apply any reserves in provinces with concentrations of younger forests and cannot achieve the desired distribution of forest age classes across those landscapes. Thus it has a reasonably high relative likelihood of sustaining well-distributed goshawk populations, but less than Alternative 5. Relative to conclusions in the Goshawk Conservation Assessment, Alternative 3 has less likelihood of sustaining well-distributed viable goshawk populations in 100 years than Alternatives 1, 4 or 5 because it relies entirely on habitat reserves that may be too small and applies a conceptually unsustainable 100 year rotation in the intervening lands between reserves. In areas with large amounts of legislated withdrawals or plan imposed land use designations that do not permit timber harvest, goshawk habitat should be maintained. The 1000' beach and estuary fringe buffer appears to be used extensively by goshawks (as indicated by radio-telemetry) and is a very important component of all these alternatives. All other alternatives have a low (Alternative 6 and 8) or very low (Alternatives 2, 7 and 9) relative likelihood of providing habitat to sustain viable goshawk populations well distributed across the Tongass in 100 years, because of the absence of an extended rotation or forestwide system of habitat reserves.

A short term (10-15 year) concern for sustaining well distributed goshawk populations also exists on the Tongass. Because of a concentration of past timber harvest in some provinces and an abundance of young forest structure, four biogeographic provinces cannot meet the extended rotation landscape composition design identified in the Conservation Assessment. To protect management options, reserves are applied in these 4 provinces in alternatives 5 and 6. Some indirect indications of populations currently at risk on one of these provinces on north Prince of Wales Island was also debated by the Goshawk Panel (Iverson 1995).

Because the goshawk is a wide ranging species that uses landscape mosaics, there are few specific goshawk standard and guideline options available to mitigate otherwise unsustainable broad landscape management strategies. Approaches considered by Goshawk Assessment authors were specific goshawk nest site management prescriptions such as those historically attempted on the Tongass (U S Forest Service 1992). This approach was considered unsustainable because its success as a conservation strategy is dependent upon locating goshawk nests which has proven difficult in the temperate rainforest. Only 40 goshawk nesting areas have been located in southeast Alaska despite 5 years of inventory and search effort. Thus, an approach was adopted in the Assessment that described a dynamic landscape composition of forest age classes likely to sustain goshawks across the landscape. A Forestwide Standard and Guideline protects an area of 100 acres around identified goshawks nests. This does not represent a comprehensive conservation strategy, but rather serves to conserve identified goshawk nesting habitat which may have specific characteristics of stand structure and landscape position and is complementary to a broader landscape strategy.

Marten

Considerations and Assumptions. Forest structure at the stand scale and integrated across the landscape was the most important factor in panel ratings and discussion. Panelists agreed, based on personal experience, the scientific literature, and local Southeast Alaska data, that marten are clearly associated with late seral and old growth forests and that marten function ecologically at broad landscape scales.

The panel found that the strong association of marten with the higher volume old growth forest strata, combined with past timber harvest that was concentrated in these highly productive stands, was cause for significant concern. The added interaction of elevation heightened concern; that is, significantly greater marten habitat use occurred below 1,500 feet in elevation where there is also a greater relative proportion of the higher volume strata and past timber harvest. Future timber harvest is estimated to be proportional to its present occurrence (50 percent harvest from the high, 40 percent from the mid, and 10 percent from the low volume strata).

Marten is a mid-level predator, thus habitat to support adequate prey populations of small mammals was considered important. Based upon forest succession in Southeast Alaska and small mammal habitat relationships, panelists concluded that 100-year timber harvest rotations were adverse to providing a continuing prey base for marten. The stem exclusion stage of forest succession persists for at least 70 percent of the rotation with a greatly simplified overall forest structure generally devoid of understory vegetation. In addition, large trees, snags and downed logs, features that contribute to enhanced forest structural diversity, and prey habitat, are not present during these short rotations. Conversely, 200-year rotations increase the structural complexity of seral forests to support prey and were viewed as a superior landscape management approach. The concept of two-aged silvicultural management was also believed to significantly contribute to forest stand structural diversity in managed forest stands. Thus, panelists felt that a 100-year timber harvest rotation applied across a large portion of the landscape would not provide the habitat necessary to support sustainable and well distributed marten populations across the Tongass.

Maintaining the old growth forest within the beach and riparian habitat zones was considered important, particularly for landscape connectivity and prey habitat diversity. Corridors that are wide enough to also serve as functional habitat to facilitate long-term landscape connectivity were preferable to narrower corridors that only facilitate movement between forest patches. The 1,000 foot beach zone was specifically considered important because of the dissected nature of Southeast Alaska islands, and generally more important that altitudinal riparian corridors. Much of the panel discussion was devoted to the interpretation of gaps in distribution, areas within which habitat capability was reduced to the point that reproductively successful marten populations may no longer exist or would exist in such low densities as to significantly increase the probability of local extirpation.

Evaluation of Alternatives. The final average panel ratings for marten are displayed in Table 3-92. Alternative 1 provided the greatest likelihood of maintaining well distributed marten populations across their current range on the Tongass. It had a mean likelihood rating of 54 for Outcome I. However, panelists indicated that even with no further timber harvest and road construction, there is still a reasonable likelihood that local populations would be reduced or gaps that limit population would be created with little interaction within the species range, as indicated by a combined score of 46 for Outcomes II and III. Concentration of past timber harvest in specific provinces and past harvest primarily in the higher volume classes which were concentrated at lower elevations contributed to this conclusion.

Table 3-92
Average Panel Assessment Ratings: Marten

Outcome	Alternative								
	1	2	3	4	5	6	7	8	9
1	54	3	4	15	17	3	3	3	3
2	25	5	40	45	53	25	6	17	6
3	21	56	41	37	24	42	27	42	46
4	0	21	15	3	6	30	39	35	24
5	0	15	0	0	0	0	25	3	21

Panelists concluded that there was little or no likelihood of extirpation of marten from the entire Tongass National Forest under alternatives 1, 3, 4, 5, 6 or 8. Alternatives 2, 9 and 7, however, were considered to have some chance of extirpation (likelihood scores of 15-25 for Outcome V). Anticipated harvest, especially in the remaining higher volume class stands at lower elevation, and road construction, contributed to this conclusion.

The likelihood that in 100 years an alternative would result in either significant gaps in distribution, populations existing in relatively isolated refugia, or local extirpations, may be an indication that marten populations would not remain well distributed across the forest. This cumulative likelihood is the sum of Outcomes III, IV, and V. From this perspective, Alternatives 2, 7 and 9 were rated identical by panelists with a cumulative rating of 91 for each alternative. Alternatives 8 and 6 have relatively high cumulative likelihood outcomes of 80 and 72, respectively. Extensive planned roading, continued fragmentation of habitat, and most importantly, a significant reduction in the important higher volume old growth forest component were factors cited by panelists that contributed to these conclusions. Even Alternative 3 with its significant reserve component had a combined Outcome III, VI, and V rating of 56, suggesting a better-than-even chance that well distributed populations may not be maintained across the Tongass in 100 years. All of these alternatives have in common a 100-year timber harvest rotation.

Alternatives 4 and 5 were rated intermediate by the panelists in their likelihood of maintaining persistent and well distributed marten breeding populations, with combined scores for Outcome I and II of 60 and 70, respectively. Extended 200-year timber harvest rotations was the most important design feature for sustainable approaches to providing marten habitat.

Commentary on the Panel Ratings. As concluded by the Marten Assessment Panel (Iverson 1996) and review by Flynn (1994), marten are an old growth associated species that require a landscape approach to longterm conservation (Bissonette et al. 1989). As such, viability concerns are primarily focused on cumulative longterm effects of conversion of complex and diverse old growth forests to structurally simple young growth regenerated conifer forests. In general, there is not an immediate viability concern evident within the short term planning period (10-15 years) relative to other old growth associated species such as goshawks and wolves. Management strategies adopted in the short term, however, may have very important implications regarding opportunities for long term conservation and maintenance of viable populations. Well distributed marten populations have been defined as occurring in every third order watershed (more generally a 10,000 landscape nearly equivalent to a Value Comparison Unit), an assumption adopted by Flynn (1994) and reviewed by Capp et al (1991) referencing the Flathead Land Management Plan Appeal decision relative to well-distributed populations.

Alternative 3 should have a reasonably high relative likelihood for supporting viable well distributed marten populations within their range on the Tongass in 100 years based upon the recommendations and analysis by Flynn (1994) which is a revised version of his original marten strategy contained in the Viable Population (V-POP) Committee Conservation Strategy (Suring et al. 1993). The marten was one of 5 species that contributed to the overall V-POP landscape conservation strategy design. The V-POP strategy was endorsed through peer review (Kiester and Eckhardt 1994) as an initial approach to maintain well-distributed viable wildlife populations. For marten, Alternative 3 should be an improvement over the original V-POP design by providing a wider 1000' beach fringe corridor and option 1 and 2 riparian habitat management buffers, often significantly wider than the 100' minimum riparian buffers identified in the original V-POP strategy. Both of these landscape habitat features were important elements in marten habitat use (Flynn 1994). Further, the 2-aged silvicultural management regime should provide enhanced structural diversity in managed stands, particularly later in the stand development. This will improve both marten prey species habitat as well as provide more complex and beneficial structure for marten cover and denning.

Alternatives 4 and 5 should have nearly equal likelihoods of sustaining viable marten populations and both at levels higher than for Alternative 3. Alternatives 4 and 5 have 200 year rotations and harvest less old growth forest, and include similar beach, riparian and 2 aged management regimes. The 200 year rotation and associated thresholds should sustain a more even distribution of old growth across all landscapes. Alternative 1 poses the least risk to marten populations by allowing for essentially no additional harvest of old growth.

Alternatives 6 and 8 may be considered intermediate at best in approximate relative risk to long-term marten viability. Alternative 6 only applies reserves in high risk landscapes but fails to conserve unfragmented blocks of landscape for future habitat needs. Alternative 8 may have a slightly lower risk with the full complement of large, medium, and small reserves but the application of a 100 year timber rotation throughout the matrix increases risk. However, the enhanced beach and riparian features serve to mitigate the intensity of matrix timber management on the 100 year rotation in both alternatives.

Alternatives 2, 7, 9 all have substantially higher risks to maintenance of longterm marten viability. They have neither a reserve system nor an extended rotation concept. Riparian and beach habitats generally receive the least protection of all alternatives.

Alexander Archipelago Wolf

Considerations and Assumptions. Perhaps the most significant factor affecting evaluators' ratings was the estimates of deer habitat capability resulting from the Deer Panel habitat model (see previous discussion of deer model and effects). Deer are the primary prey of wolves in Southeast Alaska, and the significance of predator/prey interactions on wolf populations led to the conclusion that wolf persistence was directly linked to deer habitat capability. Therefore, to the extent the individual design features of an alternative affected deer habitat capability the feature was important to the alternative likelihood rating. There were no overall identified positive or negative contributions of major alternative design festures such as reserves versus extended rotations, presence of an extended beach zone, or any specific riparian option.

Genetic differentiation was considered but was not a major factor in outcome ratings. The key factor revealed from the genetic data was the indication that interchange among wolves was occurring between major island groups in Southeast Alaska. On the other hand, direct ecological evidence suggests the existence of dispersal barriers or at least severe limitations. The panel considered hypothetical dispersal corridors between the Stikine River and Prince of Wales Island. However, the absence of wolves on Admiralty, Baranof and Chichagof Islands and lack of dispersal of radio-marked wolves away from Prince of Wales Island suggests the potential inability of wolves to successfully disperse across major water barriers. Thus insular populations of wolves may indeed exist in Southeast Alaska, and this has profound implications for conservation strategies and maintaining well distributed populations.

Roads as a management issue affecting wolf mortality were considered. There was general agreement that mortality related to roads is a human education and management issue and not specifically a road issue. Thus likelihood outcome rating were not generally affected by existing or planned miles of road construction, although some discussion focused on the extended rotation alternatives and general requirement for relative increase in roading in those alternatives. Conversely, some discussion indicated a preference for a reserve based landscape strategy to provide roadless refugia for wolves.

The concept of well distributed populations received considerable discussion, specifically what constituted a 'gap' in wolf distribution that would trigger an Outcome III rating. Wolf dispersal capabilities were an important element in this dialogue as wolves are capable of dispersing several hundred miles. Some panelists considered a gap in distribution to be complete extirpation from major islands such as Prince of Wales and that a single wolf pack there could represent a well-distributed population. There was no agreement on this issue, especially from local experts.

Panel discussion generally concluded that a gap could be created in wolf distribution through the effects of forest management that reduced deer habitat capability to the extent that a pack no longer occupied a former territory. Ephemeral, dispersing individuals may occasionally occur in that formerly occupied range, but habitat was insufficient to continue to sustain a reproductively successful pack, and there would be limited interaction between individuals and packs resulting from these gaps.

Evaluation of Alternatives. The final average panel ratings for Alexander Archipelago wolf are displayed in Table 3-93. For all alternatives, there is virtually no chance of extirpation of the wolf from the Tongass National Forest (Outcome V). All alternatives had only one of a possible 100 points assigned to this outcome. This likely represents a chance catastrophic event that, in combination with normal Forest Service activity, would result in the complete extirpation of wolves.

Table 3-93
Average Panel Assessment Ratings: Alexander Archipelago Wolf

	Alternative								
Outcome	1	2	3	4	5	6	7	8	9
1	80	35	59	34	48	26	3	8	3
2	14	25	25	39	34	38	26	43	31
3	3	30	14	24	16	31	51	40	48
4	2	9	1	3	1	4	19	9	18
5	1	1	1	1	1	1	1	1	1

Alternative 1 provided the greatest relative likelihood of maintaining stable well distributed wolf populations across their current range on the Tongass. However, panelists indicated that even with essentially no action, past management activity that reduced deer habitat capability on some portions of the forest (north and central Prince of Wales Island were specifically identified) would result in some likelihood (14) of locally reduced population levels. Outcome II for Alternative 1 was explained as the likely result of natural fluctuations in wolf populations in response to prey availability and other environmental factors.

Because of the intensity of proposed harvest activity and anticipated significant regional reductions in deer habitat capability, Alternatives 2,7,8 and 9 were rated with some likelihood (range 9-19) of creating populations that would exist in refugia with severely restricted interaction between them (Outcome IV).

The likelihood of an alternative resulting in a situation in 100 years where either gaps in distribution occur, populations exist in refugia, or total extirpation may be a general indication that wolf populations would not remain well distributed across the Tongass compared to historical distributions. This cumulative likelihood is considered the sum of Outcomes III, IV, and V. Alternatives 7 and 9 both have a relatively high cumulative likelihood outcome, 71 and 67 respectively. Moderate likelihoods exist for Alternatives 8 (50), 2 (40) and 6(36). These cumulative outcomes are generally directly related to the total harvest levels and associated reductions in deer habitat capability and all have in common a 100-year timber harvest rotation timber management regime.

Commentary on the Panel Ratings. Results of the Wolf Panel are considered in a broader context, incorporating additional available information. Maintaining well distributed and viable wolf populations in southeast Alaska involves two principal management concerns. For all alternatives, current mortality rates in localized areas such as north Prince of Wales Island (POW) may result in local declines in the wolf population. Secondly, reductions in deer habitat capability from timber harvest in some alternatives may negatively affect wolf populations. Wolf/deer population interactions in conjunction with human deer harvest and environmental variability is a complex relationship. There is certainty, however, that reductions in long-term deer habitat capability can eventually adversely affect all three of these interrelated components wherever wolves occur.

Wolf mortality concerns are primarily focused on POW (GMU 2) due to the high existing road densities, that often exceed 1 mile/mile square of landscape, providing greater trapping/hunting access). Wolf mortality results from natural events, legal hunting and trapping, as well as illegal kills. Human access to significant portions of the wolf range on POW increases wolf vulnerability to legal and illegal mortality. Wolf harvests have increased in GMU 2 over the last 15 years dramatically (over 100%), with the greatest increases occurring during the last 5 years (ADF&G, unpubl. Data) exceeding an estimated 50% of the population in some locales.

In the remainder of the wolf range from Yakutat to Dixon Entrance on the mainland, short-term viability concerns in response to management activities are not as high despite lower wolf densities. This difference is due to the generally unroaded nature of the mainland, difficulty of hunter access, minimal past timber harvest, relatively minor anticipated reductions in deer habitat capability and a more diverse prey base upon which wolves depend. Further, wolf harvest has been relatively stable over past 15 years (ADF&G unpubl data) in GMU 1a,b, and c, at least indirectly suggesting a temporary equilibrium between harvest mortality and net habitat capability. Wolf harvest rates in GMU 3 were low but stable, but have increased during the last 5 years, probably in response to recovering deer populations.

Within this planning period, wolf mortality will be addressed through coordinated management between the Forest Service and the Alaska Department of Fish and Game. Forestwide standards and guidelines for wolves (Wildlife Section) that are applicable to all alternatives include such direction to address wolf mortality. Using this approach was also a principal recommendation of the Wolf Panel. Roadless refugia, or more appropriately managed human access, also should be established (Kirchoff et al. 1995) to provide for core populations that are more isolated from current sources of mortality. The Wolf Panel recommended against use of a road density threshold "rule of thumb". This was contrary to Kirchoff (1993) and Pletscher (1994) who recommended a road density threshold of no more than 1 mile of open roads/square mile. Site specific, project level analyses will identify solutions to manage high mortality levels since local, prescriptive solutions are beyond the level of specificity available in the forest plan. In addition, seasons, harvest methods and bag limits must be used as a population management tool by the ADF&G as a complimentary approach to manage wolf mortality.

Deer populations declined significantly in GMU 3 from 1969 to 1972 as a result of heavy and long-lasting snowfall; deer hunting was closed for 18 years. Extremely severe winters are apparently periodic and may occur every 15-20 years in southeast Alaska (Juday 1984). Wolf populations persisted, at least in low densities, in spite of significant deer population declines and wolves (and perhaps black bears) apparently factored heavily in limiting deer population recovery that took nearly 20 years in some areas such as Mitkof Island. Other regions of GMU 3 still maintain low deer densities, well below carrying capacity (e.g. Kuiu Island).

The periodic nature of these severe winter events suggests that during the next 10-15 years there is a high likelihood of such an event occurring again in southeast Alaska. Within the longer 100 year period, perhaps 3-5 such events could be expected. As deer habitat capability is reduced from timber harvest of high volume old-growth winter range, the magnitude of deer population declines resulting from these events will presumably increase. Population recovery times will likely increase and thus directly affect wolf populations where deer are the primary prey on the islands of GMU 2 and 3. As such, it should be a management objective to reduce the frequency and magnitude of periodic lows in deer populations, primarily through maintenance of longterm deer habitat capability.

Deer are the principal prey of wolves and wolf long-term viability is directly related to deer habitat capability, a point of common agreement between members of the Wolf Panel and Kirchoff et al. (1995). Harvest of high volume deer winter range reduces modeled deer habitat capability (See Deer section). Fragmentation of deer habitats also increases deer vulnerability to predators, especially in winters of heavy snowfall (McCullough 1994). Immediate concerns in all alternatives focus on the cumulative effects of past timber harvest on the reduction in deer habitat capability on POW. Deer habitat capability has declined over 20% since 1954 in 11 of 24 Wildlife Analysis Areas on POW. In 2 WAAs capability has declined over 40%. A 3-4 decade lag time can be expected between timber harvest and observed or modeled deer population response (see Deer section). Deer populations can be expected to begin responding negatively to timber harvest that occurred 30-40 years ago. Further, POW has not experienced a severe winter for over 20 years.

Short-term management concern may, however, be heightened because evidence suggests that wolves on POW may represent a relatively isolated population. First, there is little apparent dispersal between wolves on POW and the adjacent mainland or major islands. Person and Ingle (1995) did not document any movement of radio-marked wolves from POW across Clearance Strait to the mainland or GMU 2 over 3 years, suggesting some degree of isolation, despite speculation to the contrary by the Wolf Panel. That major bodies of water may serve as dispersal barriers is supported by the absence of wolves on Admiralty, Baranof and Chichagof Islands. Further, the proportion of dark pelage wolves in the overall harvest in southeast Alaska may exceed 50%, whereas on POW dark phases only represent 14.5% of the harvest; body size of both males and females harvested on POW were smaller than the over all harvest (Person and Ingle 1995), suggesting some variation in allele frequencies.

The recent study by Shields (1995) did not detect any genetic differences, among wolves in southeast Alaska, in spite of small sample sizes and use of less definitive laboratory techniques. However, total genetic isolation is not necessary to consider a population relatively isolated. A chance immigration of just 1 breeding individual per generation (10 years, or other similar ecological time frame) may be sufficient to maintain genetic heterozygosity and thus generally preclude genetic differentiation. The demographic consequences of isolation are, however much more severe since the chance interaction of just 1 individual per generation would likely be insufficient to rescue a declining population, thus possibly resulting in local extirpation.

Alternatives 1, 4, and 5, with lower anticipated timber harvest, will result in the least reduction in deer habitat capability on POW and thus have a higher relative likelihood of maintaining wolf populations. Long-term reductions in deer habitat capability in Alternatives 3 and 8 may place wolf populations at greater risk on POW and possibly GMU 3 because the evenaged short rotation management of lands between habitat reduces deer habitat capability and the proposed habitat reserves are considered too small (McCullough 1994) to support wolf populations.

Projected cumulative declines in deer habitat capability in GMU 2 in alternatives 2, 7, and 9 are also cause for concern on POW. Risks elsewhere within the range (GMUs 1a, b, c or 3) are slightly lower because of lower levels of past timber harvest. Continued reductions in deer winter range coupled with the likelihood of another periodic severe winter could lead to deer populations declines equal to or greater than those experienced in GMU 3 in 1968-1971. Consequences of such an event to wolves as well as human uses of deer may be significant.

Kirchoff (1993) recommended that a deer density of 5 deer/mile^2 was necessary to sustain a deer/wolf equilibrium in GMU 2. He revised this to 13 deer/mile^2 taking into account the additional factor of human deer use rates under current conditions of modeled deer habitat capability, human deer harvest and wolf population estimates. Six Wildlife Analysis Areas (WAAs) on POW currently support comparable or lower modeled deer densities of 13 deer/mile^2 (Table 3-89), suggesting that perhaps 25 percent of the WAAs on POW may be at risk of either not sustaining current wolf populations, or current levels of human deer harvest, or both. A Forest-wide Standard and Guideline in the Proposed Forest Plan maintains sufficient deer habitat capability to support at least 13 deer/mile^2 where deer are the principal prey of wolves. This standard should preclude further declines in deer habitat capability that would adversely affect this equilibrium. This complex interacting equilibrium could be disrupted with likely increases in human deer harvest, or alternatively, increased deer harvest demand may not be satisfied. Because deer model outputs have not been validated and this threshold equilibrium level is a working hypothesis, this analysis indicates areas of relative concerns rather than an absolute management threshold.

Marbled Murrelet

Considerations and Assumptions. The panel noted the lack of distributional and ecological information about marbled murrelets, especially in Southeast Alaska. They appeared to make the following general assumptions about harvest practices and other components of the alternatives relative to marbled murrelets and in particular to nesting habitat.

1. The best or most important habitat is found within large contiguous blocks of high-volume, low-elevation old-growth forest. In Yakutat and Glacier Bay this may include stands of large mature Sitka spruce.

2. The main concern with fragmenting or reducing such habitat (1.) is an increase in predation rates (more edge and less interior).

3. Canopy cover above the nest (highest in the higher-volume stands) is another critical factor in keeping predation rates lower.

4. The maintenance of old-growth forest reserves, and extended rotations, are both seen as ways to retain suitable nesting habitat. Large reserves, and rotations greater than 200 years, are favored; an alternative that would provide both Forest-wide would be ideal (assuming timber harvesting is to continue). Rotations averaging 100 years are not long enough to provide suitable habitat.

5. Riparian and beach fringe old growth, due to its linear nature (more edge, less interior), is considered less suitable nesting habitat than interior old growth. Alternatives with higher amounts of riparian and beach fringe protection may work against murrelets by pushing harvest into critical nesting habitat. Conversely,

higher riparian protection could lead to improved habitats overall through a synergistic effect resulting from more interconnectivity.

6. The retention of spatially-explicit small old-growth reserves (as in the one/watershed in Alternatives 3 and 8) is favored over the "33 percent residual" concept of Alternatives 5 and 6.

Evaluation of Alternatives. Average panel ratings are shown in Table 3-94. Based on these ratings, the alternatives fall roughly into four groups. Alternative 1 is by itself with all of its outcome points assigned to Outcomes I or II. The very low level of timber harvest, all of it under a 200-year rotation, caused this alternative to be rated considerably higher (in terms of ensuring viability) than the others. The assignment of points to Outcome II was primarily a result of the amount of low-elevation, high-volume old growth already harvested.

Table 3-94
Average Panel Assessment Ratings: Marbled Murrelet

	Alternative								
Outcome	1	2	3	4	5	6	7	8	9
1	85	18	41	36	45	26	10	25	16
2	15	34	40	38	46	33	20	38	29
3	0	40	19	24	6	36	45	31	38
4	0	9	0	3	3	5	23	6	18
5	0	0	0	0	0	0	3	0	0

Alternatives 3, 4 and 5 all rated fairly high, with at least 74 percent of the points in Outcomes I or II. Alternative 5, offering extended rotations and reserves in critical areas, had the highest viability scores of this group, although the panel would have preferred spatially-identified small reserves rather than the 33 percent residual old growth concept. The full reserve system and greater riparian protection, combined with two-aged management, of Alternative 3 was favored somewhat over the Forest-wide uneven-aged management, but no reserves, of Alternative 4.

Alternatives 2, 6, 8 and 9 each have most of their points (67-74 percent) assigned to Outcomes II or III, and except for Alternative 9 have over 90 percent in Outcomes I-III, providing moderate to high viability ratings (although not all panelists felt Outcome III would meet viability requirements). The rationale for these scores varied by alternative. Alternatives 6 and 8 rated highest of this group due largely to their reserve systems; Alternative 8 also offers two-aged rather than even-aged timber harvesting, and Alternative 6 watershed-specific residual old growth requirements. The 100-year rotations in each were a drawback. Alternatives 2 and 9 rated somewhat lower than Alternatives 6 and 8, neither of the former having a reserve system and both using even-aged harvest with 100-year rotations.

Finally, Alternative 7, similar to Alternatives 2 and 9 and with a higher timber harvest level, had the lowest viability rating, assigning 2/3 of its points to Outcomes III or IV.

Commentary on the Panel Ratings. The marbled murrelet is second only to the Other Terrestrial Mammals panel with respect to the lack of local information available to assess longterm viability. Viability concerns for the marbled murrelet in southeast

Alaska intensified due to listing of this species as threatened under ESA in California, Oregon, and Washington and the very close habitat affinity with coastal old growth forests (Ralph et al. 1995). Information to substantiate this concern in southeast Alaska is only indirect relative to the loss of nearly one million acres of productive old growth coastal temperate rainforests throughout southeast Alaska (including all ownerships). These are generally the more productive sites at low elevation, presumably some of the best murrelet nesting habitat. However the strength of the association between murrelet nesting habitat and highly productive old growth forest has not been established, especially since two of the four nests located in Southeast Alaska to date have been on the ground.

Short term (10-15 years) risks to murrelet viability are difficult to assess but are likely minor especially given the magnitude of recent conservative population estimates of over 250,000 marbled murrelets in southeast Alaska (U.S. Fish and Wildlife Service 1995). Further, murrelets appear to be highly mobile traveling up to 50-60 miles per day on foraging flights (U.S. Fish and Wildlife Service, 1995) suggesting at least the possibility of relatively high population interaction throughout southeast Alaska. Short term risks are likely proportional to the amount of additional old growth planned for harvest among alternatives (1, 5, 4, 3, 6, 8, 2, 9 and 7 in order of increasing risk) within the planning period covered by the TLMP Revision. While large block reserves in general may be a preferable conservation strategy, the small (1600 acre) block reserves (Alternatives 3, 8 , 5 and 6) in each watershed may significantly contribute to maintenance of nesting habitat and well distributed populations in the absence of additional information on nesting habitat relationships. Forestwide Standards and Guidelines protect nesting habitat around any identified murrelet nests. However, only four murrelet nests have been found so this standard is not considered as a viable conservation strategy. Rather it serves to protect habitat surrounding the few nests that may be located for long term monitoring and studies to understand murrelet habitat relationships .

Under the assumption that productive old growth habitat is the preferred murrelet nesting habitat, then the loss of an additional 1.5 million acres in some alternatives, in addition to the million acres already lost, could contribute to a long-term viability concern. This concern may become greater if future research reveals a significant murrelet selection for high volume low elevation forests that are sought for timber production, similar to the situation documented in the Pacific Northwest (Ralph et al. 1995). A provision to harvest timber in proportion to its occurrence within a management area (see the discussion of “Proportionality” in the Timber section) mitigates the rate of loss of higher volume timber stands by distributing timber harvest among all volume strata.

Even over long time periods, there is less relative concern for the marbled murrelet compared to other old growth associated vertebrates assessed by panels. Average murrelet scores for Outcome I and II rated higher than all other species in all alternatives except for the wolf in Alternatives 2 and 3.

Other Terrestrial Mammals

Considerations and Assumptions. The panel identified two groups of mammals for evaluation: (1) widely distributed taxa associated with productive old-growth (*widely distributed group*), and (2) endemic taxa associated with productive old-growth (*endemic group*). The *widely distributed group* was comprised of the following:

black bear (*Ursus americanus pugnax* Swarth)
Canada lynx (*Lynx canadensis canadensis* Kerr)
wolverine (*Gulo gulo* luscus Linnaeus)
fisher (*Martes pennanti* [Rhoads] Miller)

northern flying squirrel *(Glaucomys sabrinus zaphaeus* [Osgood] A.H. Howell)
river otter (*Lutra canadensis mira* Goldman)
mountain goat (*Oreamnos americanus columbiae* Hollister)
silver-haired bat (*Lasionycteris noctivagans* [LeConte] Peters)
California Myotis (*Myotis californicus caurinus* Miller)
Keen's Myotis (*Myotis keenii keenii* [Merriam] Miller and G.M. Allen)
little brown Myotis (*Myotis lucifugus alascensis* Miller)
long-legged Myotis (*Myotis volans longicrus* [True] Miller and G.M. Allen).

The *endemic group* was comprised of the following:
Prince of Wales Island flying squirrel (*Glaucomys sabrinus griseifrons* A.H. Howell)
beaver (*Castor canadensis phaeus* Heller)
Keen's mouse (*Peromyscus keeni sitkensis* Hogan et al. 1993)
red-backed vole (*Clethrionomys gapperi stikinensis* Hall and Cockrum)
red-backed vole (*Clethrionomys gapperi solus* Hall and Cockrum)
red-backed vole (*Clethrionomys gapperi wrangeli* [V.Bailey] Hall and Cockrum)
red-backed vole (*Clethrionomys gapperi phaeus* Swarth)
Admiralty Island meadow vole *(Microtus pennsylvanicus admiraltiae* Heller)
Sitka meadow vole (*Microtus oeconomus sitkensis* Merriam)
ermine (*Mustela erminea alascensis* Hall)
ermine (*Mustela erminea initis* Hall))
ermine (*Mustela erminea celenda* Hall)
Admiralty Island ermine (*Mustela erminea salva* Hall)
Suemez Island ermine (*Mustela erminea seclusa* Hall).

The panel used the approach of assigning the likelihood scores given to the most vulnerable or sensitive taxa within a group to the entire group. For example, if a panelist reasoned that habitat conditions created by Alternative 6 represented a 30 percent likelihood that Outcome V (extirpation) would occur for Keen's Myotis, then the panelist would assign a 30 percent likelihood score for Outcome V to the *widely distributed group*.

The panel predicted that all of the proposed alternatives had some likelihood of causing extirpation within the endemic group. This prediction was attributed to both historical and proposed timber related activities. These likelihoods increased with higher levels of timber harvest proposed. Conversely, the panel also predicted that mountain goat, one ermine (*Mustela erminea salva*), beaver (*Castor canadensis phaeus*), and Admiralty Island meadow vole would largely experience no adverse effects under all alternatives.

The panel also predicted that most of the alternatives have a relatively high likelihood of creating conditions where wildlife populations may be no longer well distributed and viability could be significantly compromised. According to the panel, a serious problem (viability) could exist once a taxon or group reaches Outcome II or III (depending on the circumstances). Most of the alternatives (except Alternative 1) had some indicated likelihood of causing extirpation of some taxa in the *widely distributed group*.

Evaluation of Alternatives. Average panel ratings are shown in Table 3-95. Alternative 1 was generally considered by the panel as the alternative least likely to negatively impact taxa under consideration. The panel predicted a higher likelihood that the *widely distributed group* would experience ephemeral range distribution gaps (Outcome II); the *endemic group* would occur more frequently in refugia (Outcome IV). Panelists assigned these outcomes based upon historical levels of timber related activities. The panel suggested that Alternative 1 could be improved by restoring old-growth in extensively harvested areas (northern Prince of Wales Island for example).

Table 3-95
Average Panel Assessment Ratings: Other Terrestrial Mammals

	Alternative								
	1	2	3	4	5	6	7	8	9
Endemic Group									
1	13	0	8	4	5	8	0	6	0
2	20	5	15	14	18	18	3	11	3
3	18	11	21	19	16	18	8	16	9
4	43	30	36	50	51	28	26	28	29
5	8	54	20	14	10	30	65	39	60
Widely-Distributed Group									
1	23	0	5	1	3	5	0	5	0
2	44	9	31	34	38	19	3	10	3
3	25	18	34	41	49	25	8	20	9
4	9	29	19	21	9	36	31	33	35
5	0	45	11	3	3	15	59	33	54

Alternative 5 was regarded by panelists as the second least likely alternative to negatively impact taxa under consideration. The panel offered higher likelihoods that the *widely distributed group* would experience both ephemeral and permanent range distribution gaps (Outcomes II and III) that could affect viable populations well-distributed across the planning area. Little brown Myotis was cited as one animal whose local populations would be more ephemeral under this alternative; it was predicted that fisher could experience significant gaps in its historic range. The *endemic group* would more likely be restricted to refugia under Alternative 5 (Outcome IV). These circumstances would increase the risk of extirpation as a result of isolation. Prince of Wales Island flying squirrel was noted as one animal that would likely only exist in refugia. A relatively longer rotation, uneven- and two-aged management systems, and old-growth retention were features the panel liked about this alternative. Panelists stressed that reserves proposed under this alternative should be carefully located within the ranges of vulnerable wildlife and that corridors be truly functional.

Panelists ranked Alternatives 3, 4, 6 and 8 as intermediate among the alternatives in terms of likelihood of negatively impacting taxa under consideration. For both the *widely distributed* and *endemic groups*, likelihood scores were fairly evenly distributed among Outcomes II, III, and IV; scores for outcome extremes (I and V) were consistently lower for these alternatives. For most of these alternatives, local populations of Sitka mouse could become more ephemeral (Outcome II); northern flying squirrel could experience permanent gaps in its historic range or exist only in refugia (Outcome III or IV); fisher could exist only in refugia (Outcome IV). The panel suggested that Alternatives 3, 6 and 8 could be improved by lengthening rotation ages and reducing harvest levels. The greater protection afforded riparian habitat proposed under Alternative 3 was identified by the panel as a positive feature for maintaining viable river otter populations.

The panel considered Alternatives 2, 7 and 9 to be most likely among alternatives to create wildlife viability problems. The panel predicted that implementation of these alternatives would result in high likelihoods that both the *widely distributed and endemic* *groups* would exist only in refugia (northern flying squirrel for example) or would become extirpated (Keen's Myotis for example). It was suggested that these alternatives could be improved by incorporating several features of Alternative 5--longer rotations, uneven-aged management, and higher levels of riparian habitat protection.

Commentary on the Panel Ratings. The Other Terrestrial Mammals Panel was asked to conduct their assessment with little information. Their assessment of alternatives produced scores that were the most conservative among all wildlife panels. There are at least two factors that probably influenced the distribution of points among alternatives. When scientists are faced with uncertainty, the tendency is to err conservatively; the paucity of information available to this panel probably increased uncertainty among the evaluators. Secondly, the total number of species represented by both groups increased the possibility of encountering species that were especially sensitive to selected alternatives and thus influenced likelihood point distribution in outcomes reflecting greater risk to maintaining viable and well distributed populations across the Tongass National Forest.

Further examination of available information can serve to focus viability concerns among these mammal taxa. Assuming that loss of productive old growth conifer forest habitat is the greatest risk facing old growth associated species, then those species most closely associated with old growth are assumed to be at greatest risk. Thus among the 14 species or subspecies included in the "endemic group", the Prince of Wales flying squirrel may be assumed to harbor the greatest viability concern. MacDonald and Cook (1994) concluded that Keen's mouse (Peromyscus) and red-backed voles (Clethrionomys) were ubiquitious with generalized habitat requirements and that voles (Microtus) were restricted to herbaceous and shrub dominated habitats. The Panel concluded (Julin 1995) that beaver are more closely associated with deciduous habitats rather than conifer old growth and mentioned little about ermine. However, Suring et al. (1993) rated the vulnerability of ermine habitat as a low level of concern suggesting a limited association with old growth forest; conversely they concluded that the northern flying squirrel was closely associated with old growth forest and rated the habitat concerns as high.

A similar analysis of the Widely Distributed Group revealed that the northern flying squirrel may be the most vulnerable species in that group as well. The wolverine was not identified as an old growth associate (Suring et al.1993) and was not rated. The lynx is a casual visitor to southeast Alaska (MacDonald and Cook 1994) and was rated as a low level of concern for loss of old growth habitat (Suring et al. 1993). The occurrence of fisher in southeast Alaska was first confirmed in 1994 along the Taku River (MacDonald and Cook 1994) and is considered a visitor in the major transboundary river drainages and most of these lands have land allocations precluding old growth harvest. The mountain goat was not mentioned in Panel discussions but is considered an old growth associate that is generally associated with steep slopes and cliff habitat (Suring et al. 1993), areas generally inoperable for timber harvest.

The black bear was rated as only moderate concern for loss of old growth habitat (Suring et al. 1993). Suring et al. (1988) concluded that food was the limiting factor for black bear habitat capability and a variety of habitats including salmon streams, estuarine grassflats, avalanche chutes, early seral conifer stands as well as old growth provided food resources suggesting a moderate association with old growth. Since salmon are a principal food source in July - September, alternatives that minimize risk to riparian habitat and fish production will benefit bears (Alternatives 1, 4, 5, 3, 8 and 6 in increasing order of risk). However black bears are unlikely the most limiting species with a viability concern within the widely distributed group.

River otters are considered old growth associates but habitat relationships indicate that terrestrial habitat use is limited to the narrow beach fringe habitat and riparian corridors (Suring et al. 1988). Thus alternatives that provide a 500' beach fringe (all but 9) and minimize risk to riparian habitats and fish habitat capability (Alternatives 1, 3, 4, 5, 8 and 6 in increasing order of risk) will likely sustain river otter populations and minimize viability concerns.

Five species of bats were included in the group but information is extremely limited. Specimen records range from two to five individuals for three species, no records for the big brown bat exist for Southeast Alaska and the little brown myotis is considered widely distributed but habitat relationships are virtually unknown (MacDonald and Cook 1994). Riparian habitats were discussed by the panel (Julin 1995) and karst systems have been mentioned as habitats associated with bat use (MacDonald and Cook 1994) on Prince of Wales Island. Thus by inference bats, may benefit from greater cave and riparian habitat protection afforded in Alternatives 1, 3, 4, 5, and 6 but whether these measures will assure maintenance of viable and well distributed populations is unknown. The Keen's Myotis was repeatedly discussed by the panel as extremely rare and is currently on the Red List of rare species in British Columbia (Julin 1995).

The two subspecies of the northern flying squirrel appear to be the most sensitive among all species assessed by the panel. This is not surprising since this was the only species specifically mentioned as an old growth associate by MacDonald and Cook (1994). More importantly, the northern flying squirrel was rated with the highest viability concern among all mammals assessed by Suring et al. (1993). Also, recent laboratory work indicates that the Prince of Wales flying squirrel may be genetically distinguished from all other flying squirrel populations that have been analyzed from interior Alaska to British Columbia (Cook 1996). This preliminary information supports the subspecific taxonomy (Glaucomys sabrinus griseifrons) and provides more evidence of insular populations that exist on Prince of Wales Island among a variety of terrestrial taxa that have limited dispersal capabilities across major bodies of water.

Habitat needs of flying squirrels contributed to the development of a multiscale, large, medium and small habitat reserve landscape conservation strategy for all old growth associated species (Suring et al. 1993). Conservation needs of flying squirrels specifically included a 1600 acre small habitat reserve in each 10,000 acre watershed to sustain habitat to support well distributed populations.

The complete set of habitat reserves are applied in Alternatives 3 and 8 and provide a moderate relative likelihood of sustaining flying squirrel populations. However, because of limited mobility of squirrels, population interaction may require forested landscape linkages not otherwise provided by beach or riparian corridors in these two alternatives which allow a 100 year timber harvest rotation in the intervening matrix. Alternatives 4 or 5 with 200 year rotations and a greater diversity of forest age classes from 0-200 years old, and riparian corridors and a beach fringe buffer, would presumably have a higher likelihood of sustaining flying squirrel populations. However, if one assumes the panel ratings were applied to just the flying squirrel then Alternatives 4 and 5 would have a combined Outcome I and II (well distributed populations) of 18 and 23. Moreover, even Alternative 1 only has an Outcome I and II rating of 33 suggesting that past management activity, especially on Prince of Wales Island has already placed this species at risk. Alternative 6 applies reserves on Prince of Wales Island, but the 100 year rotation in the matrix would likely isolate populations that exist in reserves. Alternatives 2, 7 and 9 have the least relative likelihood of sustaining well distributed flying squirrel populations because they have neither reserves or extended rotations. While all of these alternatives would provide some old growth unsuitable for timber production, the amount, quality, and distribution of these acres remains unknown.

Finally, the Panel recommended special management consideration be applied to small islands (Julin 1995). This is largely due to high levels of endemism already documented (MacDonald and Cook 1994) as well as the likelihood of additional endemism that may occur within the island archipelago on the Tongass. Lidicker (1994) shared similar concerns for small islands and the maintenance of biodiversity and recommended that no timber harvest occur on islands less than 1000 acres in size and islands greater than 1000 acres should have at least one habitat reserve. He also recommended islands with known endemics, or islands that were extremely isolated should be completely protected from commercial timber harvesting.

In Table 3-96, islands are listed that are generally larger than 640 acres, contain suitable timber lands, are available for timber harvest, and do not have any allocated habitat reserves in at least some alternatives. There are several hundred additional islands smaller than 640 acres that have not been identified in this brief analysis.

Table 3-96
Small Islands with Potential Viability Concerns [1]

Ketchikan Area	Stikine Area	Chatham Area
Thorne	Witney	Sullivan
Marble	Keku	Halleck
Orr	Mitkof	Catherine
Spanberg	Woewodski	Kruzof
Tuxekan	Vank	Partofshikof
El Capitan	Sokolof	Krestif
Stevenson	Rynda	
Grindall	Kadin	
Heceta	Zarembo	
San Fernando	Level	
St. Philip	Bushy	
Suemex	Shrubby	
Sukkawan	West	
Long	Blashke	
Square	Woronkoski	
Black	Deer	
Hassler	Ruth	
Gedney		

[1] Islands larger than 640 acres in size without habitat reserves and that could be harvested for timber in at least one alternative.

Brown Bear

Considerations and Assumptions. Riparian habitat emerged as one of the more important elements of brown bear ecology addressed by panelists. The relationship between riparian habitat management and the maintenance of habitat capability in sustaining anadromous fish production (see Fish section) is one aspect. Salmon obtained from mid-summer to early fall represent a very important food source for accumulation of energy reserves to sustain overwinter denning for a substantial proportion of the brown bear population in most years. Panelists agreed that any factor that diminished net fish production and long-term habitat capability related to variations in riparian habitat management standards was directly related to the assessment of long-term brown bear persistence, and thus favored features that reduced management risk to the fishery resource.

A second aspect of riparian habitat management is vegetative cover provided by riparian habitats. Cover for visual obscurity is important for minimizing interactions among bears and between humans and bears. In addition, unpublished data from local studies revealed that bears also use daybed loafing sites within the riparian zone where salmon are taken to avoid interaction with other bears. These sites are generally within 500 feet from the stream. A brown bear standard and guideline that establishes an objective to provide visual cover along streams important for brown bear foraging, without providing specific distances, was considered inadequate, and even the largest buffers (over 250 feet) provided in Riparian Option 1 on some channel types were considered insufficient to meet riparian cover objectives for brown bears. Panelists strongly recommended that a minimum 500' no-harvest riparian buffer be maintained along streams considered important for brown bear foraging.

Roads and human access and the effect on brown bear populations was considered equally important. The panel specifically clarified that the issue was the human access and use of roads and not necessarily the physical nature of the road itself. However, to the extent that road construction and presence also contributed to reduced habitat capability for anadromous fish populations, a major concern revealed by the fish panel, the panelists' overall concern over roads was heightened. Data was presented that revealed a correlation between miles of road that facilitated human access and bear mortality on northeast Chichagof Island.

The likely abandonment of brown bears from once inhabited landscapes along the Juneau road system was cited as evidence of effects of human access and presence at a more intensive level, a clear example where a gap in brown bear distribution had developed. Thus absence of bears from one or more adjacent major watersheds constituted a gap in distribution. Design features of alternatives relative to harvest techniques, harvest thresholds, rotation lengths, unevenaged management and other factors affecting upland old growth forest structure were of secondary importance in panel deliberations. However, factors that increased road construction and repeated human entries into a watershed were viewed as adverse to brown bear populations, especially the concept of dispersed, extended rotation timber harvests.

Panelists favored the reserve concept in alternative design, not necessarily as a large block of unfragmented old growth, but rather as landscapes providing roadless refugia from human disturbance. Most panelists considered the large 40,000 acre reserves as generally adequate in relation to the smaller home ranges of brown bears in Southeast Alaska. Medium reserves were considered too small to independently sustain brown bear and rather functioned as landscape linkages between large reserves. Twenty miles between large reserves was considered beyond the average dispersal movement from telemetry data presented. However, several examples of large movements documented on Admiralty Island demonstrated a capability of bears to move significant distances.

The panel considered current population trends and concluded that there is no evidence of short- or long-term brown bear population declines anywhere in Southeast Alaska. Current mortality rates are estimated at four percent from all sources. The population is apparently reproducing at a rate matching current mortality and thus maintaining current populations. Anticipated cumulative effects of planned management may result in reduced brown bear habitat capability, reductions in population size with the resulting creation of more gaps in distribution, or some populations existing in isolated refugia. Implicit in this conclusion is that even if all regulated and permitted harvest would cease, mortality rates would exceed four percent from other sources due to anticipated increases in roading and human population, resulting in at least locally declining populations.

Evaluation of Alternatives. Average panel ratings are shown in Table 3-97. Panelists unanimously agreed that brown bears are not likely be extirpated in 100 years from the Tongass National Forest under any alternative. All panelists rated Outcome V as 0 for all alternatives. Wilderness and LUD II (legislated) areas essentially assure brown bear persistence somewhere in Southeast Alaska in 100 years. Alternative 1 was rated highest in total likelihood of maintaining brown bears in their current distribution, with combined scores of Outcomes I and II of 93, although certain populations would experience some reduction in overall density (a 53 score for Outcome II). The likelihood rating of 7 for Outcome III is due to the extent of past roading and an anticipated future growth in human use of existing roads, in spite of little or no additional timber harvest.

Table 3-97
Average Panel Assessment Ratings: Brown Bear

	Alternative								
Outcome	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	40	4	10	8	7	6	0	1	0
2	53	35	50	47	59	45	16	28	14
3	7	37	36	37	34	38	44	50	45
4	0	24	4	8	0	11	40	21	41
5	0	0	0	0	0	0	0	0	0

Due to the planned extensive timber harvest and associated road construction, Alternatives 7 and 9 had the highest likelihoods of limiting distribution of brown bears such that they might exist only in isolated refugia, with Outcome IV scores of 40 and 41, respectively.

Panelists generally agreed that either Outcomes III, IV or V would not represent well distributed populations based upon the assessment criteria they were provided. Alternatives 2, 7, 8, and 9 all had combined scores of over 50 for Outcomes III, IV, and V combined. All of these alternatives have in common relatively extensive planned timber harvest and all are managed with a 100-year rotation. While panelists liked the reserve concept that establishes roadless refugia and is a forest-wide feature of Alternative 8, this alternative had a combined score of 71, higher even than Alternative 2 (combined score of 61). Thus reserves did not compensate for the extensive timber harvest and roading that would likely exist between reserves. These four alternatives present the greatest relative long-term risk to the maintenance of well distributed brown bear populations in 100 years.

Alternative 3 ratings did not appear to reflect the panelists' conclusion that riparian habitat protection was a significant feature in brown bear management. Alternative 3 has the widest riparian buffers on most channel types, yet was rated similarly to Alternatives 4, 5, and 6, with combined Outcome I and II scores of 60, 55, 66, and 51, respectively. The extended rotations in Alternatives 4 and 5 inferred greater dispersion of future timber harvest into roadless watersheds and were rated similar to Alternatives

3 and 6 in spite of much less total planned harvest of old growth. Nonetheless, these four alternatives had a moderate relative likelihood of maintaining brown bear populations at least in their current distribution in spite of the potential for development of temporary gaps in distribution.

Based upon work conducted by Dr. Shields at the University of Alaska, genetically distinct and relatively isolated subpopulations of brown bears exist in Southeast Alaska. Bears on Chichagof and Baranof are different from Admiralty and these bears are distinct from the mainland bears that are more similar to interior British Columbia bears. In addition, brown bears in Southeast Alaska are more closely related to polar bears than brown bears in other regions of Alaska.

These subpopulations were rated separately. Panelists generally had greater concerns for the mainland bear populations than the other two. The mainland population was rated consistently lower than Chichagof/Baranof for all alternatives in combined Outcomes I and II. In fact only Alternative 1 provided better than an even average likelihood rating of maintaining a well distributed population in 100 years on the mainland. These ratings support discussion that focused significant concern on the low density population that may already exist in relatively isolated regions. Anticipated future roading and human access development would exacerbate this natural situation and place these populations at additional risk.

Four alternatives (1, 3, 4 and 5) had combined Outcome I and II scores over 50 for the Chichagof/Baranof population, suggesting a better-than-average likelihood that persistent and well distributed populations would exist in tha area in 100 years. Alternatives 2, 7, 8 and 9 could result in at least the development of permanent gaps in brown bear distribution. _Panelists believed brown bears had a very high likelihood of maintaining persistent and well distributed populations on Admiralty Island due to its Wilderness designation that would preclude development considered adverse to brown bears. Ratings for all alternatives were above 97 for Outcomes I and II.

Commentary on the Panel Ratings. Brown Bear Panel findings were generally consistent with available literature (e. g. Schoen et al. 1992, Titus and Schoen 1993) and additional local information (see Iverson 1996a) especially with respect to the potential adverse effects of roads and the importance of riparian habitats. This analysis further examines finer spatial scales and shorter time frames and associated viability risks to brown bears and complements the longer time frame (100 years) and broader geographic ranges considered by the Bear Panel.

While the Brown Bear Panel generally concluded that most long term concern was related principally to the low density mainland bear populations, a shorter term management concern may exist of brown bears on northeast (NE) Chichagof Island base upon past timber harvest, roading activity as well as direct positive relationships between roads and bear mortality (Titus and Schoen 1993). Despite the apparent absence of brown bear population declines or apparent low densities, risks and management concerns exist. Brown bears are long-lived species, have a delayed age of first breeding to 5-10 years, and very low reproductive rates; all factors that may delay population response to environmental stresses. Sufficient time may not have elapsed since significant forest management activity has occurred on NE Chichagof Island for cumulative impacts to the brown bear population to be evident. However, restrictions in brown bear harvest regulations instituted in 1988 (Schoen et al. 1992) due to high harvest rates indicated heightened management concern.

The likely presence of brown bear subpopulations in southeast Alaska is supported by genetic analysis (Talbot and Shields 1996) and local information regarding brown bear movements, habitat use, and differentiation in morphological characteristics. Brown bears on NE Chichagof may also be effectively demographically isolated from brown bears on the remainder of Chichagof Island (Titus, K ADF&G in Iverson 1996a).

Lande (1994) expressed concern about the recommended habitat conservation reserve strategy (Titus and Schoen 1993) because of the low actual and effective population sizes of five female brown bears that would be supported in 40,000 acre habitat reserves on Baranof and Chichagof Islands may be insufficient. In addition, a few reserves fall short of meeting reserve design criteria and their integrity and function may have been compromised (e.g. Game Creek large HCA on NE Chichagof Island, Iverson 1996b). This may reduce the effectiveness of the landscape strategy and may increase localized but long term risk to the brown bear population there. However, reserves may be more important to brown bears as sources of roadless refugia rather than as unfragmented blocks of old growth forest. Roaded human access is directly related to brown bear mortality, except where special management precautions have been applied, such as Greens Creek Mine (see Iverson 1996a).

Forestwide Standards and Guidelines applied to all alternatives directs the development of a management program in cooperation with the ADF&G to address brown bear mortality. Management tools will include both access (road) management as well as harvest regulations. Thus, in combination with a brown bear mortality management plan, the reserve strategy in Alternatives 3 and 8 and portions of 5 and 6, particularly since they are applied to NE Chichagof, may reduce local short term risks to brown bears and represents lower risks than other approaches of extended rotations (Alternative 4) or alternatives lacking either reserves or extended rotations (Alternatives 2, 7 or 9).

Riparian habitats are clearly very important to brown bears and riparian management significantly contributes to longterm brown bear persistence. Riparian management Forestwide Standards and Guidelines for Options 1 and 2 provide old growth forest riparian buffers of at least 250' and up to the entire width of riparian floodplains plus up to 200' buffers on streams most likely to be used by brown bears. Alternative 3 applies riparian Options 1 and 2 and in combination with habitat reserves should mitigate any near term concerns on NE Chichagof Island and, except for Alternative 1, would likely have the least longterm risk to important brown bear habitats among all other alternatives.

Alternatives that do not have reserves (2, 4, 7 and 9) or only apply higher - risk Option 3 riparian buffers everywhere (Alternatives 2 and 9) present greater short and long term risks to brown bears and important riparian habitats. Even Option 1 and 2 riparian buffers may not fully meet the 500' riparian buffer recommended by the Brown Bear Panel (Iverson 1996a). Removal of productive old growth forests from these important habitats are decisions with effects that persist for decades or even centuries. However, if the recommended 500' buffer is not achieved after site specific application of all necessary riparian buffers, additional buffers may be applied to meet brown bear habitat objectives. Brown Bear Forestwide Standards and Guidelines protect important brown bear foraging habitats along Moderate Gradient/Mixed Control and Floodplain riparian channel process groups.

Brown bear management concerns with respect to short-term risks are apparently less significant for the remainder of the brown bear range in southeast Alaska.

Combined Panel Outcomes

Based on the definitions for the five outcomes, Outcomes I or II assume that "habitat ... of sufficient quality, distribution, and abundance" will be maintained so that breeding populations are distributed ("well distributed" in Outcome I) across the Tongass National Forest. Under Outcomes III or IV, on the other hand, significant gaps in distribution, or existence only in refugia (isolated populations), are anticipated. Outcome V represents extirpation. Therefore the scores for Outcomes I and II may be combined to provide some indication of the relative likelihood that viable populations will remain distributed across the Forest. Most panels also came to this same conclusion. These combined scores, for each of the panels just discussed in detail, are displayed by alternative in Table 3-98.

Table 3-98
Panel Likelihood Scores for Outcomes I and II Combined

	Alternative								
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Northern Goshawk	97	24	52	65	74	50	12	27	23
Marten	79	9	44	60	70	28	9	20	9
Alex. Arch. Wolf	94	60	84	72	82	64	29	50	34
Marbled Murrelet	100	51	81	73	91	59	30	63	45
Other Mammals:									
Endemics	33	5	23	18	23	26	3	17	3
Widely-Distr.	67	9	36	35	41	24	3	15	3
Brown Bear	93	39	60	55	66	51	16	29	14

Even for Alternative 1, which will maintain current conditions essentially unchanged over time, the outcome scores from the "other mammals" panel appear anomalous in comparison to the scores from the other panel assessments. As noted in the previous discussion, the other mammals panel dealt with aggregates of terrestrial species about which on the whole very little is known: the knowledge base for these species is much poorer than for the species treated individually by panels. This in turn suggests that the uncertainty inherent in assessing current status and estimating future effects was higher for this panel.

When faced with high levels of uncertainty, panelists tended to score alternatives lower, choosing to err on the conservative side by assuming a greater risk than might be the case (the so-called "Type II" error) rather than assuming less risk than might be the case (a "Type I" error). Risk assessments typically favor making a Type II error - over-estimating an actual negative effect - than making a Type I error - under-estimating a negative effect. In natural resource management, if effects are over-estimated, projects or activities may be fewer or smaller than they might otherwise have been, but the potentially affected resource is maintained; if effects are under-estimated, however, there may be more or larger projects, but the affected resource may suffer accordingly. While the outcome scores for all the panels include some amount of compensation for uncertainty, this appears to be much more the case for the other mammals panel scores.

Another feature of the other mammals scores that makes comparisons difficult is that panelists used the individual species with the worst estimated outcome to represent the aggregate of species for each of the two subgroups of other mammals. Depending on the actual reasons for rating the one species "worst," this naturally tends to overstate the risk for all the other species in each group. These high individual risks are important to point out, and knowing them can help us provide specific measures to maintain the necessary habitats for these species, and decide where to place an emphasis on additional research. But for overall alternative evaluation these ratings may be misleading, and tend to make broad comparisons difficult.

One way to address this anomaly in making comparisons between alternatives will be presented here. Since Alternative 1, which has essentially no timber harvesting, maintains most current conditions over time (there will of course be changes as previously-harvested areas move through the stages of forest succession), it can be used to represent existing habitat conditions, and serve as a baseline against which to measure and compare the other alternatives. In comparison to Alternative 1, changes in outcome scores can be seen as indicating the additional risks inherent in an alternative over and above whatever level of risk is present today. A simple way to do this is to let Alternative 1 mean "no additional risk" to viability, setting all its outcomes equal to 100 or "no risk," and then convert all other outcome scores (from Table 3-98, the combined Outcome I and II scores) to percentages of Alternative 1. These percentages then represent the relative likelihood of maintaining the existing habitats and conditions contributing to viable populations over time. These adjusted scores are shown in Table 3-99.

Table 3-99
A Baseline Comparison: Combined Likelihood Scores for Outcomes I and II, as a percent of Alternative 1 scores

	Alternative								
Species	1	2	3	4	5	6	7	8	9
Northern Goshawk	100	25	54	67	76	52	12	28	24
Marten	100	11	56	76	89	35	11	25	11
Alex. Arch. Wolf	100	64	89	77	87	68	31	53	36
Marbled Murrelet	100	51	81	73	91	59	30	63	45
Other Mammals:									
Endemics	100	15	70	55	70	79	9	52	9
Widely-Distr.	100	13	54	52	61	36	4	22	4
Brown Bear	100	42	65	59	71	55	17	31	15

It should be immediately pointed out that these adjusted "scores" are not viability ratings per se, as are the original panel scores, and are useful only as a comparative measure for evaluating alternatives for additional risks to viability in the future. By setting all Alternative 1 scores to 100, we have evened-out or normalized the disparity between the scores for different panels (as previously discussed), but this is not intended to imply that under Alternative 1 there will be no viability concerns, only that there will likely be no additional concerns from planned actions. At any rate, it is now possible to compare the other Alternatives across the range of panel scores and more easily see their relative risks to future wildlife viability.

Alternative 5 has the most consistently-high comparison scores, and is greater than 60 percent of Alternative 1 for all categories. This is no doubt due to the combination of extended timber harvest rotations, reserves in key areas, and the full compliment of wildlife-oriented standards and guidelines. Alternatives 3 and 4 are higher than 50 percent of Alternative 1 in all categories, but in most cases have scores lower than Alternative 5. The extended rotation management of Alternative 4 is favored over the Forest-wide reserve system of Alternative 3 for some species (goshawk and marten), but the reverse is true for most other species. These alternatives generally have the same set of wildlife-oriented standards and guidelines as Alternative 5.

There is a distinct break in comparison scores between Alternatives 3, 4 and 5 and the remaining alternatives. Alternative 6 has most scores above 50, but is below 40 for two species (marten, and widely-distributed other mammals). This is likely due to its use of shorter rotations with only a limited reserve system. Alternative 8 has three scores above 50, but the rest range from 22-31 relative to Alternative 1, with low comparative scores for goshawk, marten, brown bear, and widely-distributed other mammals. Alternative 8, in contrast to Alternative 6, has a Forest-wide reserve system, but fewer wildlife-oriented standards and guidelines, and lands between reserves more intensively managed.

Another break occurs for the remaining three alternatives, each of which have several categories at less than 20 relative to Alternative 1. Alternatives 7 and 9 are very close in most categories, with Alternative 2 slightly better in several. All these alternatives rely on even-aged management with short rotations, have no reserve system applied, and generally have fewer (or less protective) wildlife-oriented standards and guidelines. Ranking the alternatives using this comparative approach, from most likely to maintain suitable distributed habitats to ensure species viability to least likely, the following order emerges: Alternatives 1, 5, 3 or 4, 6, 8, 2, 7 or 9.

All of the previous viability analysis has been based on the species, or "fine filter," approach discussed in the introduction to Wildlife environmental consequences, and in the Biodiversity section. The biodiversity analysis took the ecosystem, or "coarse filter," approach. Without repeating the discussions of the old-growth ecosystem panel assessment used for biodiversity, it is nevertheless interesting to compare the ranking of alternatives arrived at here with the ranking resulting from the composite ratings for old-growth ecosystems (discussed in the Biodiversity section, and based on Table 3-13). For the likelihood of maintaining old-growth ecosystems Forest-wide, the order is: Alternatives 1, 5, 4, 6, 3, 8, 2, 9 and 7. This is essentially the same likelihood order as the one based on species viability, with the only distinct difference being the reversal of Alternatives 3 and 6. It appears that Alternative 3 was favored for wildlife due to its enhanced riparian standards and Forest-wide reserve system, whereas the watershed-specific old-growth requirements of Alternative 6 favored it in terms of maintaining old-growth ecosystems. Otherwise, the fine-filter and coarse-filter analyses tended to comparatively score the alternatives identically.

Short-term Effects Related to Viability

The introduction to the analysis of wildlife viability pointed out the need to take a longer-term perspective in evaluating potential effects to species viability. In part this relates to our inability to realistically take into account, let alone measure, how short-term, incremental actions (habitat changes) may affect a particular species' ability to perpetuate itself over time. Although Forest Plans are focused on the 10-15 year planning period, the effects or results of planning must be put in a longer-term context, with the assumption made that the same level of forest management (i.e., amounts of timber harvest, recreation use, etc.) will occur over each decade of this extended period as are planned for the first decade. This longer period is called the "planning horizon" in the NFMA Regulations, defined as: "[t]he overall time period considered in the planning process that spans all activities covered in the analysis or plan and all future conditions and effects of proposed actions which would influence the planning decisions" (36 CFR 219.3). As noted, the analysis of wildlife viability done by the assessment panels used 100 years as the planning horizon.

If Forest-wide viability per se cannot be adequately evaluated in a short-term context, such as the initial decade of implementation of the Revised Forest Plan, what aspects of wildlife management are reasonable to evaluate? Short-term, localized concerns have previously been discussed for several species, such as brown bear and wolf. The huntable wildlife resource is another aspect, discussed for Sitka black-tailed deer above (and in detail in the 1991 SDEIS). A third aspect is focusing on particular portions of the Forest where past and present actions have already altered habitats to a substantial degree, so that any additional (and therefore short-term) changes could potentially reduce the suitable habitats of some species within that area to the point that viability becomes a short-term, localized concern. (A similar approach is used above for Forest-wide effects where Alternative 1 is used as the indicator of the current habitat condition. Here we will focus on indicators other than the assessment panel results.) Changes within landscape-level ecosystem units, based on the biogeographic provinces discussed in the Biodiversity section, can be used for this purpose, as can identifying possible barriers to wildlife travel between provinces or other large landscape units.

The Biodiversity section evaluated the 21 biogeographic provinces for their current condition, primarily in relation to the amount of productive old-growth forest still present. As discussed in that section, the "productive" component of the old-growth forest resource is considered one of the most “at risk” habitat types Forest-wide, both for maintaining natural diversity, and for its association with many of the wildlife species of the Tongass. It is also the type most at risk from timber harvesting. The amount of productive old-growth forest remaining - as a percent of that existing prior to large-scale, human-caused habitat changes within the Tongass - is a good general indicator not only of habitat loss in itself, but also of how fragmented that habitat is likely to be. Additionally, using a modified version of the provinces, an evaluation of how much productive old growth remains in an "interior" forest condition is included (interior forest - as opposed to forest edges - is considered an important habitat component for many species), as is an evaluation of how much "higher-volume" old growth remains (also considered by many to be an important habitat component for some species). (These components are all discussed in detail in the Biodiversity section.) At the biogeographic province level, using these indicators, several areas of the Tongass can be identified that have undergone significant changes largely resulting from forest management practices over the last 40 years. Table 3-100 displays these areas.

Table 3-100
Some indicators of habitat change for selected biogeographic provinces

Biogeographic Province	Percent of Productive Old-growth Component Remaining [1] Total Prod. OG	Interior OG	Higher-Volume OG
N. Prince of Wales	68	51	56
Etolin Island	85	75/54 [2]	79/53 [2]
S. Outer Islands	86	74	75
East Chichagof	89	69 [3]	70 [3]
East Baranof	88	77 [4]	75 [4]
Kupreanof/Mitkof	90	82/60 [5]	81/60 [5]

Source: Based on information in the section on Biodiversity.
[1] Compared to 1954 estimated productive old-growth forest amounts.
[2] The Etolin Island province was broken into smaller units for this analysis. The first number represents Wrangell Island, the second Zarembo Island.
[3] This number is for the northeast portion of the East Chichagof province.
[4] This number represents all of Baranof Island excluding Kruzof Island. Kruzof Island is at 72 percent interior old growth and 63 percent higher-volume old growth.
[5] The first number represents Kupreanof Island, the second Mitkof Island.

Most other biogeographic provinces have 90 percent or more of their productive old-growth forests remaining, 85 percent or more of it in an interior forest condition, and have more than 85 percent of the higher-volume component remaining. For the areas in the table, however, habitat changes are such that there may be potential for reaching a local viability concern for old-growth-associated species with additional habitat alterations. These changes could in turn mean that there is a higher likelihood that suitable, well distributed habitat to ensure viable wildlife populations may not be maintained Forest-wide (such local changes creating significant gaps in habitat). Alternatives that minimize significant habitat alterations in general, or in these specific areas, will have a greater relative likelihood of maintaining habitats in the short-term so that a Forest-wide viability strategy remains feasible. Alternative 1, which has essentially no additional habitat changes, has the highest likelihood in this respect. Next are those alternatives that use uneven-aged management with extended rotations as the principle harvest method (Alternatives 4 and 5), and then alternatives that, while using 100-year rotations (either even-aged or two-aged systems), incorporate a Forest-wide reserve system, or reserves in key areas. Alternatives 3 and 8 include a Forest-wide reserve system; Alternative 6 (along with Alternative 5) includes reserves in three of the six provinces listed in the table. Alternatives 2, 7 and 9 include neither extended rotations, nor any system of habitat reserves.

Another aspect of identifying potential adverse short-term effects on maintaining well distributed, viable populations is determining if management activities are likely to create barriers that could affect species distribution. Such barriers, or "pinch-points," can result when habitat changes such as timber harvesting or road construction reduce or eliminate natural migration or dispersal corridors. Four areas have been identified where past and continued future timber harvesting might result in pinch-points. These are all relatively narrow areas between larger land units where future alterations in habitat could significantly reduce natural connectivity, thereby affecting the ability of land-based species to disperse or migrate. A general description of these four areas follows:

1. The portage between Tenakee Inlet and West Port Frederick on Chichagof Island, a narrow neck of land connecting northeast Chichagof Island to the main

body of the rest of the island. This is in the East Chichagof biogeographic province.

2. The area between Port Camden and the Bay of Pillars on Kuiu Island (Kuiu Island biogeographic province), a narrow neck of land connecting the northern part of the island to the rest of Kuiu Island.

3. The Neck Lake area between Whale Passage and El Capitan Passage on Prince of Wales Island (North Central Prince of Wales biogeographic province) has had significant past and on-going forest management activities. It also is a relatively narrow piece of land connecting the extreme northern end of Prince of Wales Island to the remainder of the island.

4. Sulzer Portage, between the West Arm Cholmondeley Sound and Portage Bay at the head of Hetta Inlet, on Prince of Wales Island. This area has had considerable timber harvesting on both National Forest and adjacent private lands, and due to a recent transfer of land ownership the pinch-point itself is now all private land. This relatively narrow neck of land joins the southeast part of Prince of Wales Island to the remainder of the island, connecting North Central and South Prince of Wales biogeographic provinces.

Potential pinch-point #1 is in the middle of the East Chichagof biogeographic province, one of the more heavily logged provinces (see previous province discussion). All alternatives except Alternative 1 include the portage itself and adjacent lands in LUD's allowing timber harvest, and thus offer the potential for additional habitat alterations that could contribute barriers to movement. Alternatives offering estuary fringe and beach fringe protection (Alternatives 1, 3, 4, 5, 6 and 8 provide an extended beach fringe; Alternative 2 less of a beach fringe) are likely to maintain much of the critical connecting habitat of the narrow portage itself; Alternatives 7 and 9 do not have such measures. Alternatives utilizing extended rotations (1, 4 and 5) are more likely to maintain connectivity in adjacent areas. The reserve systems of Alternatives 3 and 8 may also benefit connectivity depending on the location of their small reserve areas (not mapped at this time); the reserves of Alternatives 5 and 6 apply only to the lands east of the portage.

All alternatives except Alternatives 7 and 8 apply Natural Setting (non-timber-harvest) LUD's to all or most of the Port Camden-Bay of Pillars connection (with a narrow strip adjacent to Port Camden in timber harvest LUD's in some alternatives) and are likely to maintain sufficient connectivity. Alternatives 7 and 8 could result in significant barriers in this area (the neck being too wide to benefit substantially from the estuary fringe and beach fringe protection in Alternative 8).

Potential pinch-point #3 is in the northern portion of North Central Prince of Wales biogeographic province, the most heavily logged province (see previous province discussion). All alternatives except Alternative 1 include the portage itself and adjacent lands in LUD's allowing timber harvest, and thus offer the potential for additional habitat alterations that could contribute barriers to movement. In contrast to pinch-point #1, alternatives offering estuary fringe and beach fringe protection (Alternatives 1, 2, 3, 4, 5, 6 and 8) are not likely to maintain much of the critical connecting habitat of this area, which is primarily inland (both shorelines are private land), and already considerably in a second-growth condition. Alternatives emphasizing extended rotations (1, 4 and 5) are more likely to maintain connectivity than the 100-year rotation alternatives. The reserve systems of Alternatives 3, 5, 6 and 8 may also benefit connectivity depending on the location of their small reserve areas (not mapped at this time).

Pinch-point #4 is now all private land, dividing the northcentral and south portions of Prince of Wales Island with a non-National Forest strip 1-2 miles wide. Continued timber harvesting is anticipated on these private lands, with the creation of a significant migration and dispersal barrier likely.

Conclusions. We have examined short-term wildlife effects in several ways: deer habitat capability and its relation to hunter demand; biogeographic provinces that may have a near-term potential of negatively affecting viability, or creating gaps in a Forest-wide viability network; and potential barriers to land movement by terrestrial species between areas of suitable habitats. In general, specific aspects of alternatives have been seen to contribute to lowering the potential that any of these short-term factors could in fact lead to an actual concern for wildlife species viability (by reaching the point where habitat alterations exceed our management capability to maintain suitable, well distributed habitats that will ensure viable populations). Alternative 1, which has essentially no additional habitat changes, is the optimum in this respect. Next are those alternatives that incorporate the deer hunting standards and guidelines (discussed under the section on deer modeling and effects), apply the estuary fringe and extended beach fringe standards and guidelines, and use two-aged management with extended rotations as the principle harvest method. These are Alternatives 4 and 5. Alternatives that use 100-year rotations (either even-aged or two-aged systems), but incorporate a Forest-wide reserve system, or reserves in key areas, along with the standards and guidelines mentioned, represent a third group also generally contributing to reduced potentials for creating viability problems. These are Alternatives 3, 6 and 8. The remaining alternatives - Alternatives 2, 7 and 9 - offer few if any of these features. Under these three alternatives, there is a relatively high short-term potential of reaching a point beyond which maintaining suitable, well distributed habitats to ensure wildlife viability Forest-wide is not possible.

Conclusion: Wildlife Viability Analysis

The issue of maintaining habitat to support, at a minimum, viable wildlife populations presents a difficult planning challenge, expecially over long time frames and in the face of uncertainty and often limited amounts of information. The panel assessments need to be placed in context with other professional scientific analyses that have been conducted to address wildlife viability on the Tongass. Overall conclusions about wildlife population viability relative to the Revised Supplement alternatives represent the synthesis of inferences from empirical data with ecological theory and professional scientific judgement.

- The wildlife viability challenge to planning was first addressed in 1990 when the Interagency Viable Population Committee (V-POP) systematically crafted a landscape conservation strategy based upon habitat conservation areas to maintain viable well-distributed populations of old growth associated species on the Tongass National Forest (Suring et al. 1993).

- At the request of the Forest Plan Revision Team, the V-POP Strategy was reviewed by the Steering Committee for Viable Population Review (Capp et al. 1991). They concluded, "we support the overall theory and design of the Conservation Strategy developed by V-POP and recommend this strategy be incorporated into the TLMP Revision to assure a high probability of maintaining longterm population viability on the Tongass National Forest."

- At the request of the Alaska Regional Forester the Forest Services' Pacific Northwest Research Station, with the assistance of 18 nationally recognized scientists versed in conservation biology, conducted a scientific peer review of the V-POP Strategy. They concluded that the V-POP Strategy "represents a solid attempt to integrate species viability concerns with the Habitat Conservation Area approach. It demonstrates a good awareness of modern concepts of wildlife managment and conservation biology. However, it ...will not ensure viability of all species." (Kiester and Eckhardt 1994).

- In response to limitations in the V-POP Strategy identified in the PNW peer review, Suring et al. (1994) provided recommendations to strengthen the V-POP Strategy based upon the PNW review comments. Their recommendations generally equate to Alternatives 4 or 5 in terms of acres of old growth harvested (Iverson 1996), an indirect measure of relative risk to species viability.

- The Forest Plan Revision Team conducted a Viability Synthesis Workshop of wildlife experts to evaluate species conservation assessment findings and previous planning strategies (Rene 1995). They fully considered and integrated findings from the above referenced reports as well as other wildlife assessments to systematically develop conservation-oriented building blocks (e.g. V-POP reserves and others) from which alternatives could be crafted. They generally concluded that the existing V-POP Strategy was intermediate in overall risk of not maintaining viable populations and other conceptual approaches with less risk were identified.

- The Wildlife Viability Panel Assessments were the latest stage in the process of developing and integrating the best available information into planning for wildlife viability on the Tongass. The V-POP Strategy was well supported by earlier reviews but was considered to need improvement as a comprehensive conservation strategy. Alternative 3 incorporates the original V-POP Strategy with improvements, but was generally rated by the panels as intermediate in relative risk to wildlife viability, with likelihood Outcomes I and II ranging around 50.

There is now an emerging body of professional scientific judgement supporting the need for a landscape conservation strategy that relies at least on something like the original V-POP Strategy or other ecological approaches for maintaining well distributed viable populations. Meeting this planning challenge compliments emerging federal policy for preventing the need to list under the ESA (Capp, 1996)

Further indication of the relative risk among alternatives specific to goshawk viability may be gleaned in the Fish and Wildlife Service's (FWS) analysis and conclusion regarding their decision not to list the goshawk as endangered. FWS stated, "it is clear that without significant changes to the existing Tongass National Forest Land and Resource Management Plan, the longterm viability of the Queen Charlotte Goshawk may be seriously imperiled" (Beattie 1995). Thus, current Tongass timber management practices and intensity (and by inference any similar alternatives), if continued into the long-term, are considered by the FWS to present serious potential risk to goshawks. Both the Goshawk Conservation Assessment and the Goshawk Assessment Panel did conclude that an approach like Alternative 4, with a 200-year timber harvest rotation, has a relatively high likelihood of sustaining viable goshawk populations.

Based upon the preceding analysis, Alternatives 3, 4, 5 and 1 have the greatest overall likelihoods of sustaining viable well distributed wildlife populations. Among these, Alternative 3 has the greatest relative risk. All other alternatives (6, 8, 2, 7 and 9) represent management approaches that, relative to the V-POP Strategy as a basis for comparison, are not supported by any of the viability analyses previously referenced, and which had viability panel assessment results that suggest that all had a low to very low relative likelihood of maintaining well distributed viable populations of old growth associated species across the Tongass National Forest.

Regional Economy

Introduction

Pre-European inhabitants of Southeast Alaska relied intensively upon the lands and waters of the region for their livelihood. More recently, the natural resources of Southeast Alaska have provided a base for economic development, supplying both employment and subsistence goods as well as a lifestyle with which many of the area's inhabitants still strongly identify. At the same time it is widely recognized that the maintenance of the forests and waters of the region is essential to the continuance of this lifestyle and the amenities associated with it. Given that the Tongass National Forest comprises the vast majority of land in the region, a Revised Forest Plan could have substantial and disparate effects upon the peoples of Southeast Alaska. Moreover, the Tongass National Forest contains large areas of essentially undisturbed forest lands. These lands represent increasingly scarce (and thereby increasingly valuable) ecosystems and are the object of considerable interest both locally and nationally. The purpose of this section of the Environmental Impact Statement is to describe, in economic terms, the relationships between the Tongass National Forest and its various beneficiaries and how these relationships might change under the alternatives presented.

The following analysis will be divided into two main sections. In the first, an economic description of the affected environment will be provided, and measures of current economic activity associated with the Tongass National Forest will be developed and discussed. These will provide a baseline description and will consist primarily of employment, income, and gross revenue figures for those industries directly dependent upon the Tongass National Forest, i.e. timber and wood products, fishing, mining, and recreation and tourism activities (including sport fishing and hunting). National Forest receipts and payments to the state of Alaska will also be treated in this section. In the second section, forest plan alternatives will be analyzed in terms of their potential effects on the baseline statistics. It must be remembered, however, that the benefits entailed in these statistics and their respective industries in no way comprise the total value society derives from the Tongass National Forest. In addition to incomes and revenues there are values which are equally important but far more difficult to quantify.

Consumer surplus is one such value, and can be described as the amount of benefit a person derives from a certain good over and above the price she must pay for that good in the market place. Adequate measures of consumer surplus are quite elusive (especially in the case of the sort of non-market goods which constitute an important part of the Tongass National Forest's benefits to society), but, to the extent possible, these values have been incorporated in the analysis found in the second section of this report. Another value which is extremely difficult to measure is existence value, or the amount a person would be willing to pay to maintain the existence of a given resource even if he had no intention of ever using it. Casual evidence suggests that the existence values associated with the Tongass National Forest are considerable (and are no doubt a primary motivating force behind the concern of national groups and their supporters in the outcome of the Forest Plan Revision). No attempt has been made to quantify existence values in this study.

The employment, income and revenue statistics are also not altogether straightforward in their derivation. In each industry numerous techniques have been used to estimate these figures, each embodying underlying assumptions and subject to varying degrees of error. Where possible, these assumptions are stated and the nature of associated problems discussed. In general, the timber industry receives the most extensive consideration in this report. This is due to two factors. First, the number and quality of relevant economic statistics is highest within this sector. To the extent possible, comparable statistics for the other industries have been developed, but, in many cases, these measures were not available. The reader must bear in mind that the absence of detailed statistics is not an indication of a lack of importance for a given economic activity.

Second, the timber industry stands to be most directly affected by forest plan alternatives, and estimates of economic impacts within the sector can be made with relatively greater surety. Once again, however, this does not necessarily imply that timber is the most important of the Tongass National Forest's outputs. Recreation and tourism, for example are estimated to have the highest net present value of all activities, even though much of this value is not captured in market transactions. Considerable attention is also given to recreation. However, due to the difficulties entailed in measuring recreation related statistics and their relation to land management practices, the numbers presented here are less certain than those associated with the timber industry. A complete accounting of the market and nonmarket benefits associated with the Tongass National Forest is a virtual impossibility. The following analysis concentrates upon those elements which are quantifiable, but it must be remembered that those elements which are not amenable to measurement are also important.

Affected Environment

Area of Influence

Because of the strong linkage of local residents to both commodity and amenity uses of the Forest's resources, the primary area of influence for the Tongass National Forest is defined as Southeast Alaska. The major resources of the Forest are used, processed or consumed by different, although overlapping, segments of the local population. Residents of Southeast Alaska account for a majority of the recreation activity on the Forest, although tourism from nonresidents is becoming more important. Timber from the National Forest is the primary fiber supply for the region's wood products industry. Similarly, the Tongass National Forest holds over 70 percent of Southeast Alaska's salmon streams and therefore provides for a major component of the region's considerable salmon fishery. The largest silver mine in North America is located on Admiralty Island, and other locations appear promising in terms of mineral development. Also, in addition to providing a strong base for the cash economy, residents of Southeast Alaska depend on the Forest's wildlife and fish resources for subsistence purposes.

The secondary influence area for the Tongass National Forest stretches outward to include the entire state of Alaska; other Pacific Northwest states, especially Washington, Oregon and California; British Columbia; and other Pacific Rim countries, especially Japan. Discussion in this document focuses on the primary area of influence and only briefly addresses the secondary area.

Historical Development

Southeast Alaska's society is influenced by a variety of cultures, from its earliest peoples to its most recent inhabitants. The abundant resources of the forest and waters have provided for the physical and cultural livelihood of local peoples for thousands of years. The earliest known human inhabitants of the area, the Tlingit and Haida, adapted well to the coastal environment, and were able to subsist on the region's natural resources and develop a rich culture. The numerous waterways allowed for mobility which aided in expanding trade and gathering food.

In the 1700s, the Russians began exploration in Alaska. The fur trade, primarily sea otter pelts, was the main force driving European colonization. When most of the sea otter populations were depleted the fur industry declined, and Russia lost interest in her North American Colony. Alaska was then sold to the U.S. in 1867. As colonization continued with the U.S. occupation, new industries developed. In the late 1800s commercial fish canning became an important part of the economy of Southeast. During that same period, the discovery of gold brought thousands of miners to the area, many of whom were then followed by their families. The most important of the early discoveries occurred in Juneau. In the 1920s and 1930s, the Depression brought a decline in fish prices and mining employment. The last remaining mines were closed during World War II.

The region's timber resources were used by the earliest inhabitants for shelter, heat, utility, and cultural purposes. The Russians also harvested timber for building ships and structures, but commercial timber harvest did not develop until the 1900s. In the earlier part of the century, small timber mills were operated in a few communities. However, it was not until the mid-twentieth century that, with the development of two large pulp mills in Ketchikan and Sitka, the timber industry became a major social and economic factor in Southeast Alaska. More recently the closure of the Sitka pulp mill and the Wrangell sawmill, and a decrease in timber harvest on private, state and federal lands have triggered a downturn in the region's timber economy.

In the 1950s Alaska focused its attention on statehood. On January 3, 1959, President Eisenhower signed the proclamation establishing Alaska as our 49th state. The concurrent economic shift towards more government employment and an expanding timber industry had implications beyond population levels and distribution. It was a shift towards a diversified economy, with less dependence on extractive and nonrenewable resources, and away from a seasonal economy.

Current Environment

Presently, approximately 73,000 people live in the towns, communities and villages of Alaska's southeastern panhandle, most of which are located on islands or along the narrow coastal strip. As of 1994, only five of Southeast Alaska's 32 communities were considered urban by U.S. Census Bureau Definition (population 2,500 or greater). However, three of these cities, Juneau, Ketchikan and Sitka, rank within the top five urban areas in the state. Only Anchorage and Fairbanks are larger. Together, these cities account for close to 65 percent of the region's total population. At 24,000, Juneau alone accounts for 40 percent of Southeast Alaska's total population.

Southeast Alaska contains approximately 12 percent of Alaska's population and six percent of its land base. Unlike the rest of the United States which is entirely organized into counties, Alaska remains largely unorganized. Within Southeast Alaska there are five boroughs which correspond to the county governments found in the rest of the United States. These include Juneau, Sitka and Yakutat, which are city/boroughs, and Ketchikan, Gateway and Haines, which have independent, incorporated communities within their boundaries. The remaining unorganized area is divided into three census areas (CA) for enumeration by the U.S. Census Bureau: 1) Skagway/Angoon CA, 2) Wrangell/Petersburg CA, and 3) Prince of Wales/Outer Ketchikan CA. While these are only statistical units, they are widely recognized by all federal agencies and most state agencies as county equivalents for Alaska.

The remote aspect of the region is reflected in a population density of around two persons per square mile, compared to the U.S. average of over 70 persons per square mile. Many locations are accessible only by boat or plane, and landing strips or seaplane facilities are located in virtually all communities. The State ferry system also transports people and vehicles between several ports in Southeast Alaska, and Prince Rupert, B.C. or Bellingham. Haines and Skagway, at the northern end of the inter-island waterway, and Hyder at the southern end, offer access to the interior and Southcentral Alaska via the Alaska Highway and Canada via the Cassiar Highway.

Overview of Tongass National Forest-Related Economy

In the following section, employment and income statistics are reported for Southeast Alaska in total and for the region's resource dependent industries. Resource dependent industries are those industries which stand to be directly impacted by policy decisions related to the Tongass National Forest. They include wood products, mining, salmon harvesting, fish processing, and recreation and tourism (including sport fishing and hunting). The primary statistical source is the employment and earnings data published by the Alaska Department of Labor. This agency publishes employment figures based on unemployment insurance contribution reports filed by state employers. Self-employed individuals are not included. Consequently, commercial fish harvesting (a major component of Southeast Alaska's resource dependent sector) is not covered. In this report, statistics related to salmon harvesting are derived using a methodology developed by the McDowell group, a private consulting firm based in Juneau (McDowell Group 1989). Alaska Department of Labor totals for Southeast Alaska are then adjusted to include employment in commercial fishing.

Recreation and tourism is also not reported as a separate industry. Employment within this sector is distributed across various industry categories, particularly the service sector. In this report, recreation and tourism jobs are derived using the IMPLAN model, a regional input-output model developed by the Forest Service. Where appropriate, employment estimates for this category are then subtracted from the Southeast Alaska totals to avoid double counting. For the recreation and tourism industry, as well as for commercial fishing, the methodologies used are further described along with their inherent shortcomings in the industry specific subsections below.

Economic activity within one industry will in turn generate activity in others as firms purchase services and materials as inputs (termed "indirect" effects) and employees spend their earnings within the local economy ("induced" effects). Consequently, in what is known as the multiplier effect, each industry will possess a unique multiplier representing its impact on the regional economy given its particular distribution of local purchases and payments. Reported employment and earnings within an industry (termed "direct") times their respective multipliers yield total employment generated by that industry. In this report, IMPLAN generated multipliers were used to derive total employment levels. Employment and income multipliers for the resource dependent industries average around 1.5, with a low of 1.32 for recreation and a high of 1.92 for fish processing. The high figure for fish processing no doubt reflects the dependence of the industry upon local fish harvesting as a major input. Relative to multipliers estimated for other states, these figures are quite low, but this is not surprising given that a higher percentage of goods and services purchased by local firms and individuals must be imported from Seattle and elsewhere. (The multipliers used here are consistent with the

Institute of Social and Economic Research (ISER) estimation of the Alaska statewide multiplier at 1.55.)

Figure 3-6 shows the distribution of direct employment in Southeast Alaska by major economic sector. Note that these numbers, and all subsequent employment figures, are expressed in average annual employment (equivalent to one year of full-time employment). The figure shows that out of 37,000 jobs in 1994, 23 percent were comprised by the direct employment contribution of resource dependent industries (see also Table 3-101). Estimates of total (i.e. direct, indirect and induced) employment from the resource dependent sector were not available because of double counting, but it is certain that the share of total employment attributable to the resource dependent industries is significantly higher. Due to a rapid increase in recreation and tourism related employment, direct employment in the resource dependent industries has risen approximately 27 percent since 1984. Total Southeast Alaska employment, on the other hand, increased by about 21 percent during the same period. As shown in Figure 3-7, the resource-dependent industry share of total Southeast Alaska employment has been relatively constant.

Direct employment shares of the various resource dependent industries within the resource sector total are displayed in Figure 3-8. Salmon harvesting and fish processing together account for 41 percent of the total, followed by recreation and tourism including hunting and sport fishing (32 percent), wood products (25 percent), and, lastly, mining (2 percent). It should be noted that the distribution of total employment (using the multipliers mentioned above) will differ somewhat due to the different multipliers attached to each industry. While the share of recreation and tourism would decline due to its relatively small multiplier, that for wood products would increase. Relative changes in share for the salmon harvesting and processing sector total employment are ambiguous due to the complimentary nature of the sector's two constituent industries (i.e. indirect effects from each cannot be directly summed to yield a total). Income shares will likewise be different due to the relatively higher wages paid in the mining and wood products industries.

Alongside the number of jobs generated within a sector, various measures may be used to help describe the quality of the jobs created. Average annual earnings are shown in Table 3-101 and roughly correspond to the wage rate pertaining to a given industry (note, once again, that these are expressed in terms of average annual employment, i.e. they are the amount a person would earn by working in the given industry for a full year). Mining, followed by wood products, occupies the top of the spectrum. These two industries are, respectively, 100 percent and 48 percent higher than the average for the region. Estimates for tourism and recreation are also slightly higher than the regional average. At $21,424, salmon harvesting provides the lowest wage of all the industries here included. Profits to fishing permit holders are not included in the fish harvesting earnings. The earning figures presented here do not reflect total income of fishing industry participants.

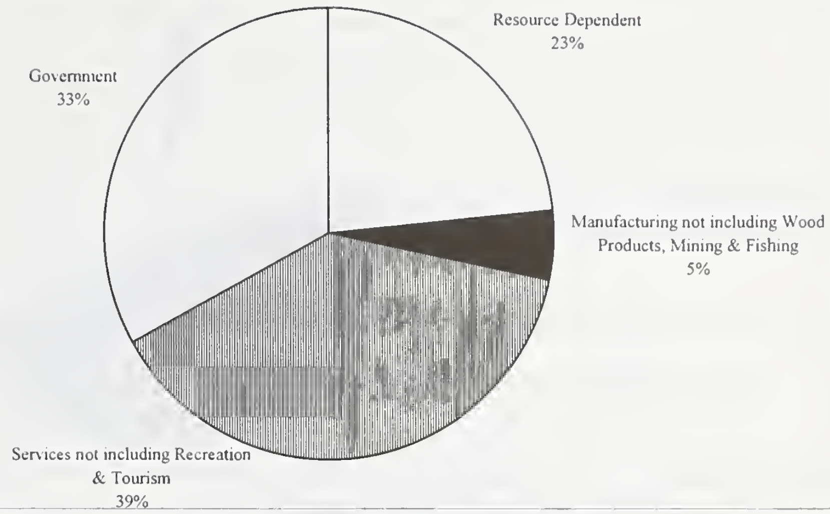
Two other characteristics of employment are of specific relevance to Southeast Alaska. These are the nonresident share and the seasonal variation in industry employment, and they are highly correlated. Nonresident shares for Southeast Alaska total employment and direct employment in the resource dependent industries are shown in Figure 3-9. At 44 percent, the share of nonresidents in the resource sector is approximately twice that for all industries within the region. This is mostly the result of the high proportion of nonresidents working in the seafood processing and recreation and tourism sectors. Other sectors, particularly mining, are substantially lower, but, with

Figure 3-6.

Distribution of 1994 Southeast Alaska Direct Employment by Major Economic Sector

Total = 37,107 Workers (Average Annual Employment)

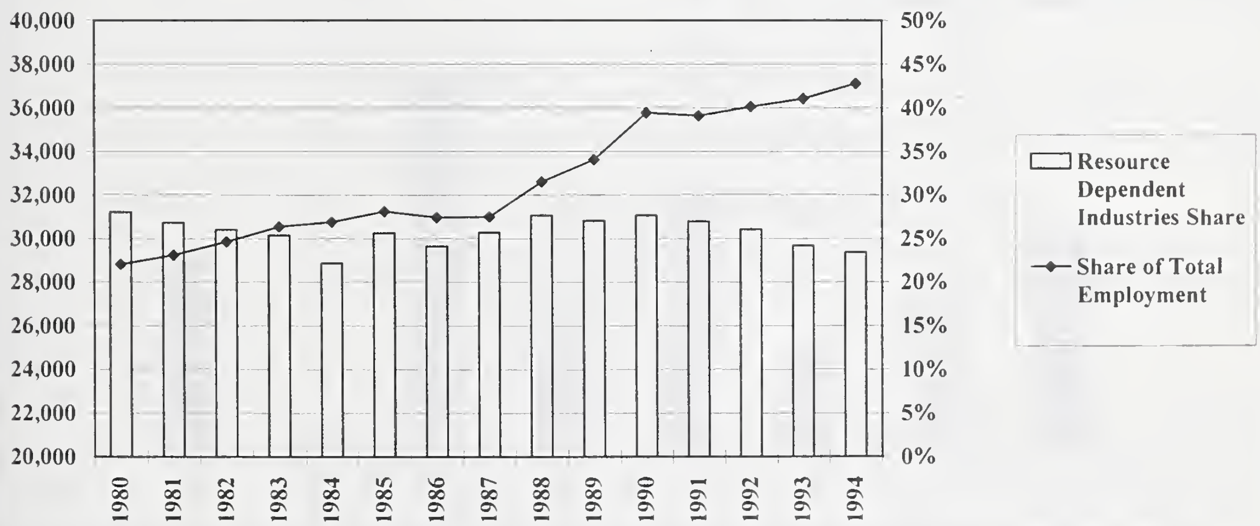
"Resource Dependent" industries include Paper and Wood Products, Mining, Fish Harvesting and Processing, and Recreation and Tourism.



Source AK Dept. of Labor and others (see industry subsections for details).

Figure 3-7.

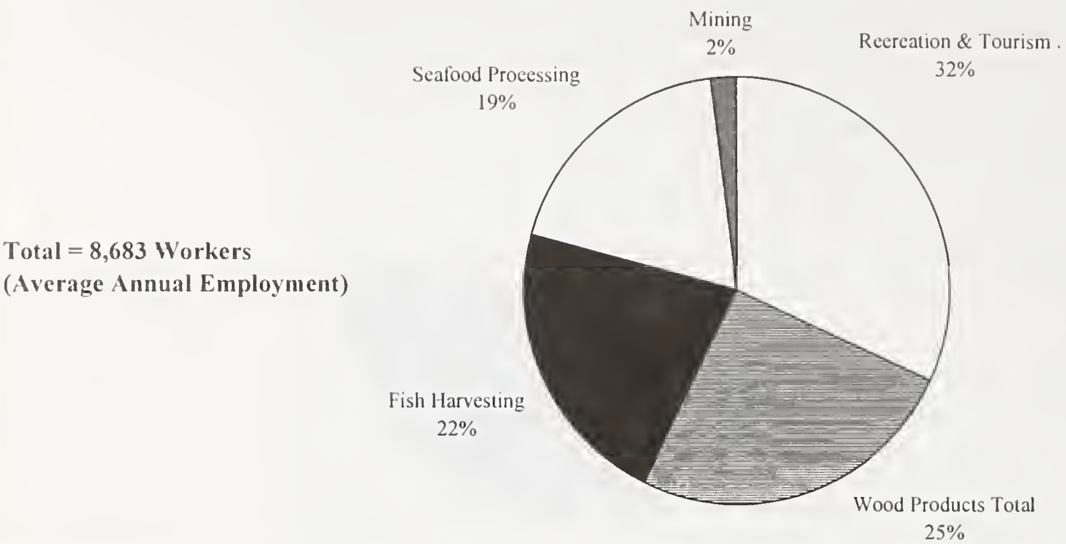
Total Southeast Alaska Employment and Resource Dependent Industry Share, 1980-1994.
Individuals Employed (Left Axis) & Share of Total Southeast Alaska Employment (Right Axis)



Source AK Dept. of Labor and others (see industry subsections for details).
Resource Dependent Industries Share is share of direct employment in Southeast Alaska total employment
Note: All employment figures are standardized to average annual employment

Figure 3-8.

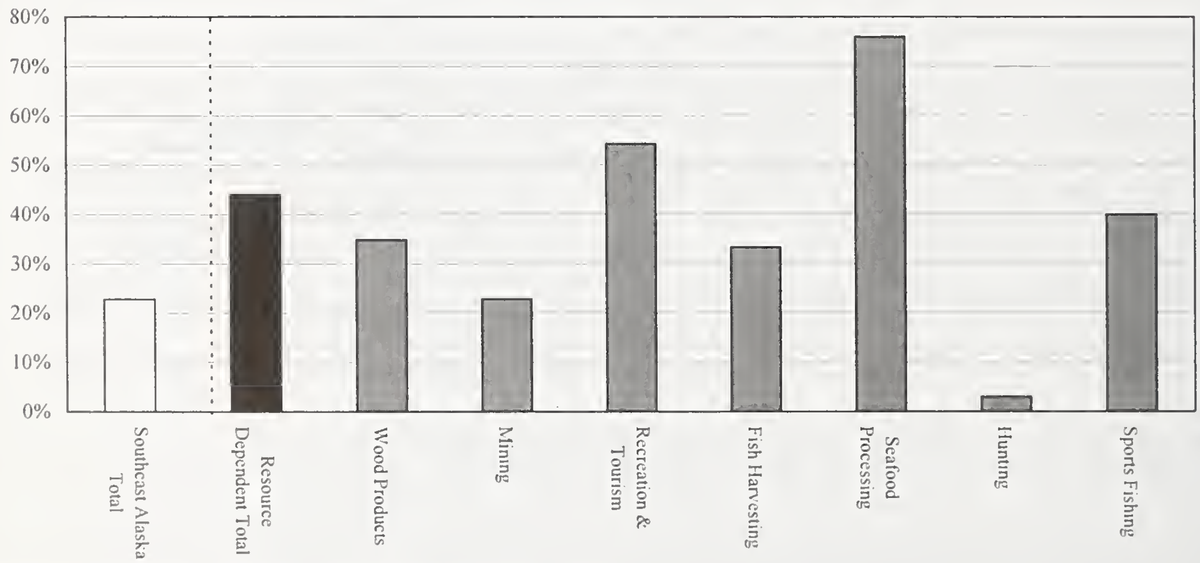
Distribution of 1994 Direct Employment Within the Resource Dependent Industries



Source: AK Dept. of Labor and others (see industry subsections for details).
Note: All employment figures are standardized to average annual employment.

Figure 3-9.

1994 Nonresident Share of Direct Employment, Southeast Alaska Total and Resource Dependent Industries



Source: AK Dept. of Labor and others (see industry subsections for details).
Note: All employment figures are standardized to average annual employment.

the exception of hunting related employment, all industries post figures higher than the regional average. It must be noted, however, that just because an employee is a nonresident, this does not mean that the job is somehow less valuable. Nonresident shares merely help to indicate how much of the benefits generated by an industry stay in the region. The seasonality of employment is another factor for Southeast Alaska, a region where the difference between peak levels of employment in the summer and troughs in the winter are quite pronounced. Figure 3-10 shows one measure which is designed to capture seasonal variation. Unfortunately, monthly statistics were not available for many of the resource dependent industries discussed here. Nevertheless, a pattern similar to that in nonresident share is apparent, with seafood processing showing an extremely high degree of seasonal variation (salmon harvesting can be assumed to display comparable but somewhat smaller figures due to increased preparation time). Though it is not reported here, it is safe to assume that tourism and recreation likewise shows a high degree of seasonal variability. With the noted exception of pulp mills, the mining and wood products industries show a higher variation than the regional non agricultural average, but significantly less than in the case of seafood processing.

Table 3-101
Employment and Earnings, Resource Dependent Industries and Southeast Alaska Total

	Individuals Employed (Average) Annual Jobs)				Employee Earnings			
Industry	1994 Direct Employ-ment	Change 1980-94	% of SeAK Total	1994 Total Employ -ment	1994 Direct Earnings (mill. $)	% of SeAK Total	1994 Average Annual Earnings	1994 Total Earnings (mill. $)
Wood Products	2,204	16%	6%	3,439	96	9%	43,453	129
Mining	163	-21%	0%	284	10	0%	59,481	17
Recreation and Tourism	2,771	100%	7%	3,664	86	8%	30,996	114
Salmon Harvesting	1,899	-0%	5%	2,697	41	4%	21,425	58
Seafood Processing	1,646	16%	4%	3,160	42	4%	25,437	80
Resource Dependent Total	8,683	27%	23%	--	274	24%	31,546	--
Southeast Alaska Total	37,107	21%	100%	37,107	1,119	100%	30,158	1,119

Source: AK Dept. of Labor and others (see industry subsections. for details).
Note: Recreation and tourism employment and income estimated from 1990 levels (derived from regional input/output model) using recreational use on the Tongass as an index. Total resource dependent employment and income is omitted because of inability to sum resident and non resident measures.

Industry-Specific Descriptions

The following subsections contain a more detailed description of each of the industries comprising the resource dependent sector. In these descriptions the derivations of the statistics discussed above are given along with time series showing their development over the last fifteen years or so. Where possible, we have also presented projections of future levels for employment and other economic indicators. Linkages between the Tongass National Forest and each industry are also discussed.

Timber

Southeast Alaska's wood products mix includes dissolving pulp, logs, cants, dimension lumber, wood chips, and a small but growing volume of specialty products. Overall, most of the Southeast Alaska's pulp production and a substantial majority of its lumber is shipped over seas, with some 30 nations represented among the purchasers. National Forest logs provide most of the basis for these flows, as private logs move into offshore markets primarily as roundwood. Japan remains the principal customer for Alaskan wood products, accounting for over 70 percent of the total export value of wood-based commodities in 1994. On volume basis, approximately ninety-three percent of Alaska's lumber exports and 75 percent of its log exports went to Japan in that year. Pulp, on the other hand, supplies a more diverse market, with just 14 percent of its volume being exported to Japan in 1994.

Southeast Alaska plays a significant role in world markets for wood products. Exclusive of Canada-United States trade, Alaska accounts for about eight percent of the softwood logs moving into Pacific Rim markets, and about four percent of the softwood lumber. While this percentage has remained relatively stable for lumber, it has increased since 1990 for log exports in spite of declining harvest volumes, no doubt reflecting supply constraints in the Pacific Northwest and substitution by Alaskan producers. The market for Alaska's dissolving pulp is global and Alaska's market shares comprises about one fifth of export trade to major consuming nations, including states in the Lower 48.

As raw material imports comprise only a small proportion of Southeast Alaska's total roundwood consumption (two percent on average for 1983-94), harvests within the region must be seen as the driving force behind the wood products industry. Figure 6 shows Southeast Alaska harvests by owner since 1983. Harvest levels range from approximately 600 million board feet (MMbf) in 1983, to peak levels of just under 1,000 MMbf in 1989 and 1990, and then to a period low of 511 MMbf in 1994. This pattern is, in turn, mirrored throughout the various other statistics which are used in this section of the report. It is likewise similar to that in Pacific Northwest harvests where a global recession in the wood products industry depressed output in the early to mid 80s, followed by a boom and then subsequent declines in harvests, in spite of rising prices, due to supply constraints. The variability is striking but not all that unusual for an industry, such as the timber sector, which is prone to boom and bust cycles.

The vast majority of the region's harvests come from two ownerships: the Tongass National Forest; and private ownership, comprised of the native corporations (see Figure 3-11). On average, over the 1983 to 1990 period these two ownerships accounted for 46 percent and 52 percent respectively of total harvests, with private harvests exceeding those on the Tongass National Forest by an average of 14 percent. Consequently, the Tongass cannot be seen as the sole driving force in the region's timber economy, and future levels in native corporation harvests must be incorporated into any predictions regarding the wood product industry's evolution. As is clear from trends in recent harvest levels, timber supply on native lands is declining. It is widely assumed that private harvests will continue to decline, stabilizing at a level of around 100 MMbf at the turn of the century (Knapp 1992, Brooks and Haynes 1994). Under this assumption continued declines in forest sector employment and revenue, particularly in logging and log export related services, is inevitable unless harvests on the Tongass can make up the approximately 100 MMbf difference between 1994 native corporation harvests and the predicted equilibrium level. Unlike the Pacific Northwest, where the private sector has been relied upon to fill the gap left by declining harvest on National Forest lands, future reductions in the availability of timber from private suppliers in Southeast Alaska will work to increase pressure on timber supply from the Tongass National Forest.

Timber from the Tongass National Forest and from native lands flow into essentially different markets. While Sitka spruce and western hemlock saw logs (the region's mainstay species) from the Tongass are banned from export and must be processed

Figure 3-10.

Average Seasonal Variation in Employment 1990-1994

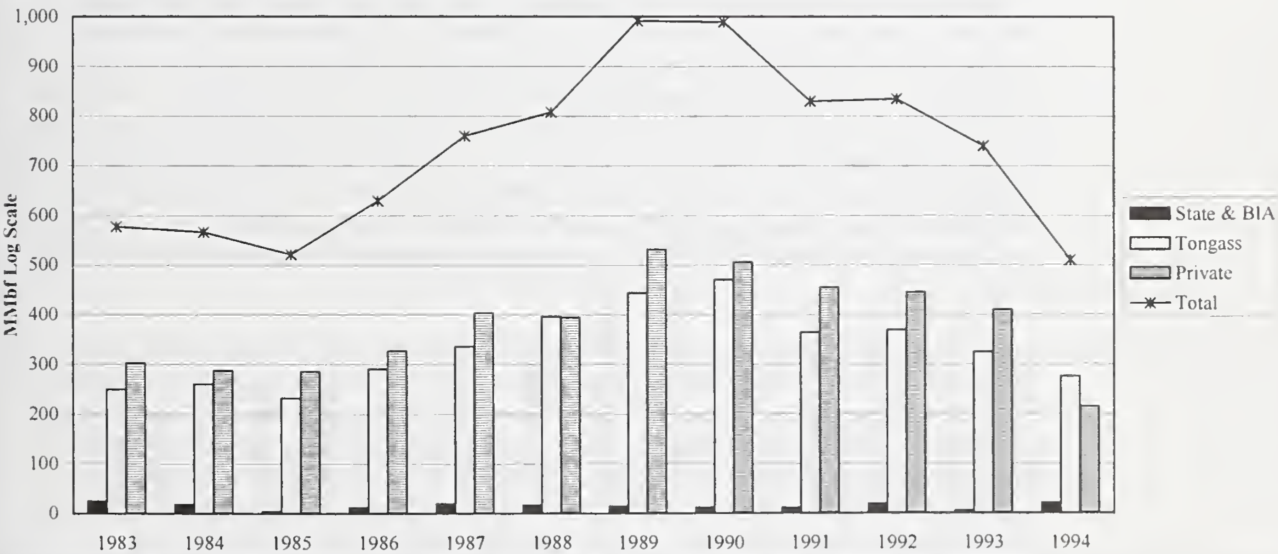
Difference between Summer maximum and Winter minimum employment divided by annual average

Source: AK Dept. of Labor and others (see industry subsections for details).

Note: 1990-94 average is a weighted average of variation in each year.

Figure 3-11.

Southeast Alaska Total Timber Harvests by Ownership, 1983-94



Source. USDA Forest Service, "Timber Supply and Demand 1994."

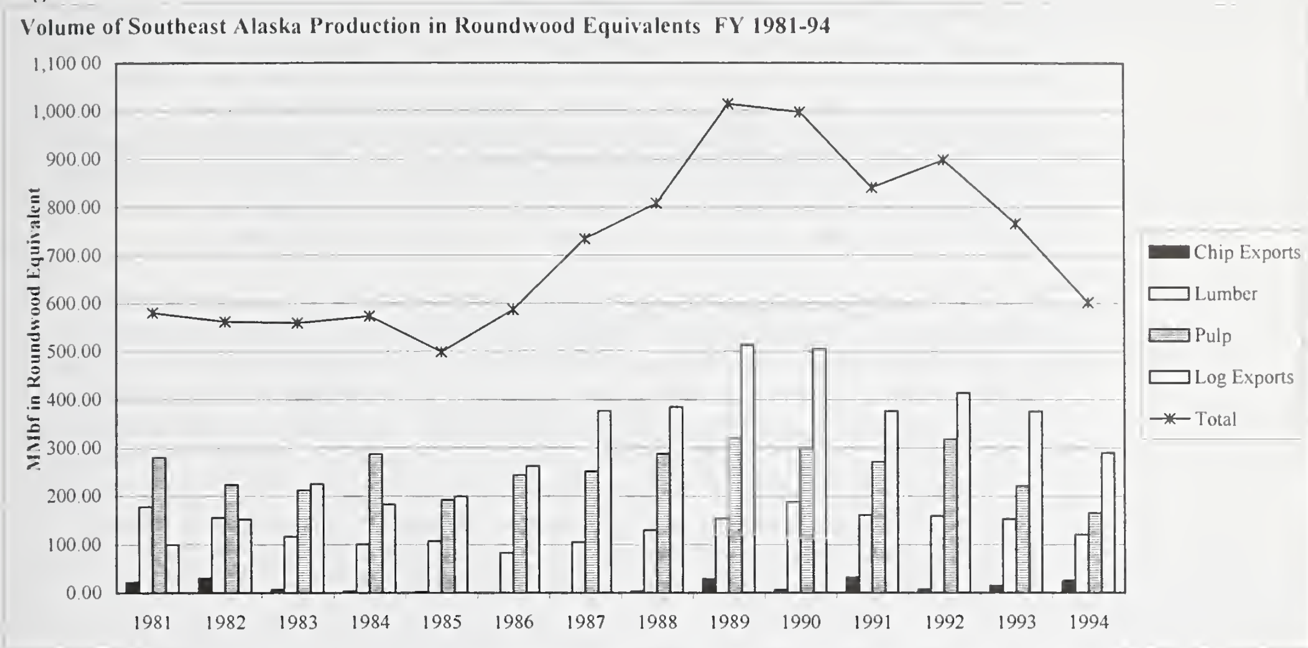
locally, the Native corporations face no such restraint, and a majority of their timber is sold in the form of raw log exports. Consequently, changes in native corporation harvests will manifest themselves primarily in changes in log exports. Both ownerships supply lower grade timber as raw material for pulp production and chip exports, and a locally strong chip market is often cited as an essential outlet for the large volumes of low quality wood which is interspersed with the higher grade sawlogs as well as for the residues generated in lumber production. On average, 19 percent of native corporation harvests are reported used in pulp production. Similarly, an average of 17 percent of Tongass National Forest logs are classified as utility grade, meaning that they are more likely to be used for pulp. This figure, however, does not necessarily indicate the amount of timber dedicated to pulp production, as lower grade sawlogs will also be chipped for pulp depending upon market conditions. According to historic reported data, 60 percent of the hemlock and 33 percent of the spruce logs are chipped for pulp.

Total volumes of wood products produced in Southeast Alaska are shown in Figure 3-12. Several manipulations were necessary in order to obtain these figures. Fiscal year export volumes for the State of Alaska reported in “Timber Supply and Demand 1994” (USDA Forest Service, 1995) were used as the primary source. Calendar year data on exports by port from the U.S. Department of Commerce were used to estimate Southeast Alaska’s share in total state exports, and these shares were then used to scale the fiscal year data. The resulting figures represent an estimate of Southeast Alaska’s exports based on state totals. Total volumes were obtained by adding estimates for domestic shipments derived from export shares reported in Brooks and Haynes 1994. In the final step, roundwood equivalents were produced using conversion factors also given in Brooks and Haynes 1994. This same methodology was used to derive gross revenues.

For comparability, all production units have been converted to roundwood equivalents (MMbf log scale). Roundwood is defined as the amount of raw material input needed to produce the reported volume of output. Comprising 43 percent of total production in the 1981-94 period, log exports are, on average, the largest component of Southeast Alaska’s production on volume basis. At 36 percent, pulp production is the second largest component of production and is far more stable than are log exports. Lumber is the smallest component of total production (19 percent). This is somewhat misleading, however, as sawmill residuals from lumber constitute a major source of chips for pulp. In 1994, for example, mill residues supplied an estimated 102,000 tons of chips to the regional market, or approximately one quarter of Southeast Alaska’s 429,000 tons of total chip supply. Logs chipped by sawmills provided another 67,000 tons. This fact serves to highlight the complimentary relationship between lumber production and local chip markets.

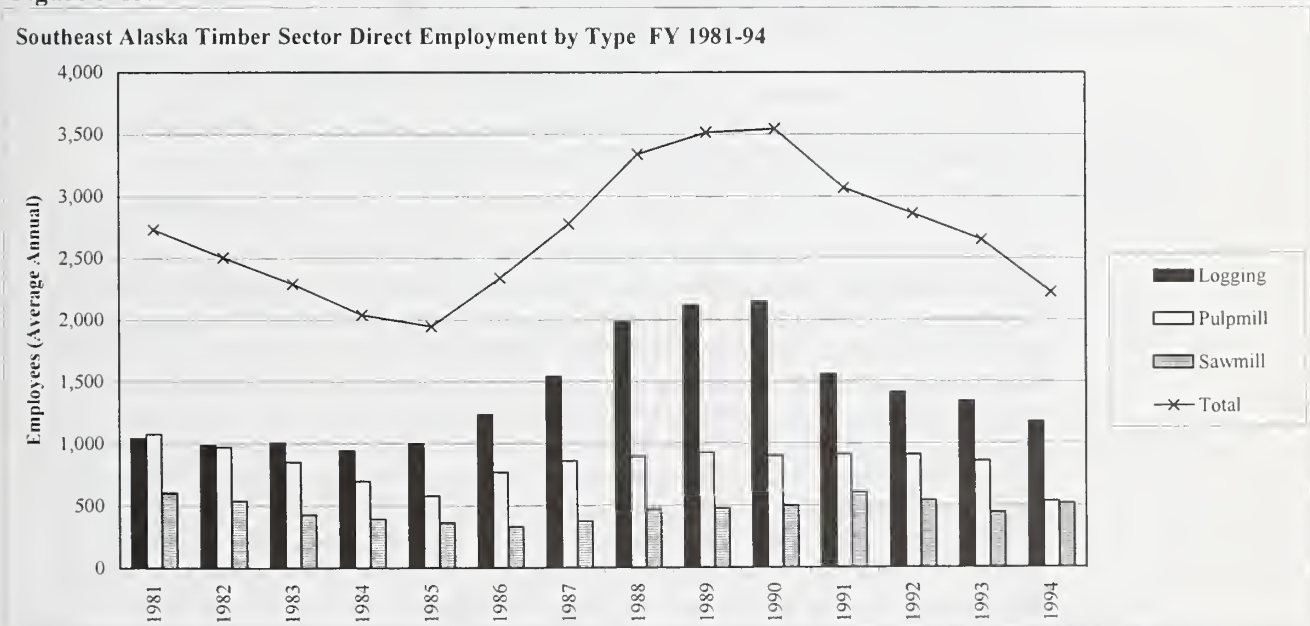
Direct employment generated by the wood products sector in Southeast Alaska is shown in Figure 3-13 and further described in Table 3-102. Once again, the pattern is familiar with generally depressed levels in the early 1980s followed by a peak in 1990 and subsequent decline, but the variation is somewhat less than in the harvest or production statistics. Lags in employment response to decreases in production are common, and further declines in employment levels can be expected even if 1994 harvest levels are maintained. On average, over the 1981-94 period, logging employment accounted for about half of total sector direct employment. Pulp production and sawmills accounted for 31 and 17 percent respectively, but in fiscal year 1994 employment in pulp production declined dramatically due to the closure of the Alaska Pulp Corporation’s (APC) mill in Sitka. Employment in sawmilling and pulp production are now roughly equal. In total, the industry has lost 1,300 jobs since 1990, but still has yet to fall below the period low of 1,947 jobs in 1985. Closure of the Wrangell Sawmill in

Figure 3-12.



Source: USDA Forest Service and U.S. Dept. of Commerce. Domestic shipments and conversion to roundwood equivalent were derived using export shares and conversion factors reported in Brooks and Haynes, 1994.

Figure 3-13.



Source. USDA Forest Service, "Timber Supply and Demand 1994."

late 1994 is not reflected in these or subsequent figures. It is assumed that the may will reopen, though at what level of operation remains unclear. Some 200 employees worked at the mill, representing close to 40 percent of the regions total sawmill labor force.

The 1993 closure of the Sitka pulp mill and more recent closure of the APC sawmill in Wrangell highlight the nature of Southeast Alaska's wood processing industry, where the size of certain key facilities is quite large relative both to the host community's economic base and to the region's total production capacity in that industry. Openings and closures of such facilities will have direct effects upon employment and production levels within their particular industries. Likewise, through the purchases of inputs, the spending of employee earnings, and through tax receipts, these facilities can strongly impact the economies of their supplier markets and host communities.

By most broad measures, Sitka has thus far weathered the APC pulp mill closure reasonably well. These measures, however, do not capture impacts upon certain economic sectors and individuals within the community, impacts which often may be quite severe. In other communities, notably Wrangell, the opportunities for substituting employment with other industries may be more limited. The closure of the Wrangell mill, if continued, may have a much more extensive impact on the community as a whole. The maintenance of adequate supplies for a specific mill is of great importance for the companies which do business with it, and for the communities in which it is located. Additionally, industry response to market or policy changes will not be smooth, involving, instead, discreet and relatively large adjustments in production and employment.

As a result of the above, the amount of timber necessary to provide for efficient operation of Southeast Alaska's mills has become one benchmark for evaluating the annual timber sale quantities (ASQ's) specified in the alternatives. Table 3-103 summarizes Southeast Alaska's installed production capacity as of 1994 and average consumption by mill over the last ten years. Ketchikan Pulp Company's (KPC) dissolving pulp mill in Ketchikan has been estimated to require 190 MMbf of pulpwood and/or chips to operate at its full annual capacity of 210 thousand tons of pulp. The company also operates two sawmills with a reported combined log processing capacity of 110 MMbf annually. Chip by-products from the sawmills are used in pulp manufacture.

In addition to the KPC mills, there are three other large sawmills operating in the region. These mills have a combined reported processing capacity of 175 MMbf per year, and they rely upon independent timber sales from the Tongass National Forest and private timber sales (KPC holds a long-term contract with the Forest Service, but its mills may also be supplied in part by independent and private sale volume). The Wrangell sawmill, however, was closed indefinitely in November of 1994. The mill's owner, the Alaska Pulp Company, is offering to sell the mill, but at least one prospective purchaser has declined, citing uncertainty in regard to future timber supply as one of the reasons. Another market segment for independent timber sales includes four relatively small sawmills with an estimated combined capacity of 30 MMbf. And, finally, there are at least 10-12 other buyers who use very small amounts of wood in the manufacture of musical instruments, cedar shakes, shingles, and lumber using small portable mills. The combined annual processing capacity of these smaller operations is estimated at 7 Mmbf.

Table 3-102
Southeast Alaska Timber Production, Revenue and Employment 1981-94

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Production (MMbf Roundwood Equivalent)														
Log Exports	100	152	225	183	199	262	377	385	513	504	377	414	376	291
Lumber	178	156	116	101	107	83	105	130	153	188	161	159	153	121
Chip Exports	22	31	7	4	2	0	0	4	29	7	32	7	15	26
Pulp	280	224	212	287	192	243	252	289	320	299	271	318	222	165
Total	581	563	561	575	500	589	734	808	1,014	997	841	899	766	602
Real Gross Revenues (Million 1994 $)														
Log Exports	84	109	142	103	102	137	206	264	290	313	220	258	278	218
Lumber	99	95	68	46	45	33	44	65	84	98	85	77	96	80
Pulp	279	244	183	226	129	148	180	249	330	272	209	228	157	113
Chip Exports	9	10	2	0	0	0	0	0	4	2	8	2	4	8
Total	470	458	395	376	276	318	430	579	708	685	522	564	536	419
Real Unit Values (1994$ / Mbf Processed)														
Log Exports	835	719	631	562	512	522	547	687	565	621	584	623	739	752
Lumber	815	917	836	718	638	601	650	770	871	813	777	713	858	878
Pulp	994	1,088	865	789	670	608	714	862	1,033	910	771	716	709	682
Chip Exports	389	304	258	120	355	NA	NA	176	144	234	240	222	289	321
Employment (Average Annual)														
Logging	1,047	991	1,010	946	1,004	1,239	1,545	1,981	2,113	2,144	1,554	1,415	1,344	1,177
Sawmills	605	540	429	395	363	331	375	468	478	500	604	538	447	515
Pulp	1,081	975	854	700	580	772	861	892	925	899	911	910	859	533
Total Direct	2,733	2,506	2,293	2,041	1,947	2,342	2,781	3,341	3,516	3,543	3,069	2,863	2,650	2,225
Indirect & Induced	1,530	1,403	1,284	1,143	1,090	1,312	1,557	1,871	1,969	1,984	1,719	1,603	1,484	1,246
Total	4,263	3,909	3,577	3,184	3,037	3,654	4,338	5,212	5,485	5,527	4,788	4,466	4,134	3,471

Source: USDA Forest Service & Alaska State Dept of Commerce.
Note: Roundwood equivalents calculated using log overrun and conversion facts found in Brooks and Haynes, 1994. Lumber unit values include revenues from the sale of mill residues for pulp production or chip export. To avoid double counting, receipts from the sale of mill residues were not reported for lumber gross revenue.

Table 3-103
Timber Processors in Southeast Alaska in FY 1994

	Installed Capacity[1] (MMbf)	Wood Fiber Consumed (MMbf Equiv.) [/1]	Percent Capacity Utilized
Ketchikan Pulp Company			
Pulp Mill	190	163	86%
Ketchikan Sawmill	50	27	54%
Annette Island Sawmill	60	32	53%
Larger Sawmills			
Viking Lumber/Chip Mill	30	16	53%
Seaborne Lumber Co.	35	19	54%
APC Wrangell Mill	110	59	54%
Small Sawmills			
Metlakatla Indian Tribe	10	5	50%
Pacific Rim Cedar	10	5	50%
The Mill, Inc.	5	3	60%
Jim Ensley	5	3	60%
Other [/2]	7	4	57%
Total	512	336	66%

Source: USDA Forest Service, Region 10 (Alaska), as reported by operators.
[/1] estimated 10 year average consumption
[/2] Includes music wood, cedar salvage, and small portable sawmilling operations

The capacity and efficiency of Southeast Alaska mills in conjunction with the availability and cost of raw material inputs will determine the ability of local producers to compete in export markets. This ability to compete roughly corresponds to the economic concept of "supply." "Demand" for Southeast Alaska wood products, on the other hand, will depend upon developments within consumer markets and within other producing regions whose products compete with those of Alaska. Overall, sustained market demand for softwood lumber throughout the Pacific Basin is predicted well into the next century. Likewise, British Columbia and the Pacific Northwest will continue to face severe supply constraints for at least the next decade. Although large amounts of second and third-growth stands in the Pacific Northwest are expected to become increasingly available in the early decades of the next century, it is doubtful that harvest levels will ever approach the peaks experienced in the 1980s and before.

As a partial result of these factors, rising real prices for logs and lumber have been commonly predicted for Pacific markets. While this is promising for Southeast Alaska firms, it must be remembered that Alaska is one of the highest cost producers supplying the Asian market. Other regions, notably the Russian Far East and the radiata pine plantations of Chile and New Zealand have a considerable competitive advantage in the production of wood fiber. However, they cannot supply in quantity the sort of quality species and grades which constitute the higher range of Southeast Alaska's product mix. The development of future demand for dissolving pulp, Southeast Alaska's other main wood product export, is more unclear, but it is generally seen as being less favorable than that of lumber.

Installed processing capacity, in conjunction with the market share of Tongass National Forest based products in export markets, has been used to estimate future levels of demand for Tongass timber. However, this "market demand" is by no means an unambiguous term and has been defined differently (with different results) by various groups and studies (e.g. Brooks and Haynes 1994, The Irland Group 1992). As no supply curves and subsequent price equilibria are used in these studies, their results do not correspond to an economic concept of demand and are more correctly viewed as predicted levels of production and sales under certain key assumptions. The approach used by Brooks and Haynes is representative and is used in this analysis as an alternate baseline projection (see below). The main assumption of the study is that Southeast Alaska lumber shares in export markets (particularly Japan) will remain stable. Given expected trends in consumption and total imports within these markets, expected levels of sawnwood "demanded" from the Tongass are estimated. With the added assumption of either one or two pulp mills operating at or near optimal capacity in the region and estimates of residual chip production from sawmilling, gross input levels needed to produce these pulp and lumber outputs are then derived. With a final assumption regarding the magnitude of declines in harvests on native corporation lands, the authors are able to estimate the level of derived demand.

Derived demand estimates for 2005 made by Brooks and Haynes (1994) under the assumption of one pulp mill operating in the region and a private harvest level of 115 MMbf are shown in Table 3-104. Employment levels for this scenario were estimated using 1990-1994 average levels of employment per unit output in the pulp and lumber industries. For comparison, 1994 statistics are included in the table. Due to a 114 MMbf reduction in native corporation harvests, the 2005 projection shows a reduced harvest relative to 1994. The projection also shows, however, a large increase in lumber production along with an increased National Forest harvest partially compensating private harvest declines. Consequently, sawmill employment in that scenario is nearly twice that occurring in 1994. Employee earnings from lumber production offset losses in the logging sector, and, in this scenario, earnings are higher than in 1994. Due to premiums associated with the log trade, however, gross business income declines slightly. This technique may be questionable in regards to pulp production, where levels of employment are relatively fixed, but we feel that this is the most direct way to capture variation in employment relative to volume of pulp production (at least within the relatively narrow range reported in these scenarios). Another problem in estimating future employment is the potential for increased labor productivity. Such increases may be partially offset by increases in product recovery from raw materials. In any case, no allowance was made for either effect in this analysis.

The scenario presented in the previous paragraph is not intended to indicate the range of potential outputs and industrial activity possible from timber harvests on the Tongass National Forest. It merely describes possible levels of activity given certain assumptions and is meant to be instructive rather than indicative. The feasibility of the outputs described in the scenario (especially lumber) will depend upon the quality of timber available from the Tongass National Forest and the costs associated with its harvest. Larger levels of production are no doubt possible, but only at increasing costs to other market and nonmarket values associated with the forest. Regarding the timber industry, the tradeoffs are relatively clear and take the form of jobs and incomes lost or gained. In other areas, the tradeoffs are generally not so direct.

Table 3-104
Southeast Alaska Timber Production and Employment, 1994 and Projections

	1994	Brooks & Haynes (2005)
Volumes Produced		
Tongass Harvest (MMbf log scale)	276	332
Private & State Harvest (MMbf log scale)	236	115
Total Harvest (MMbf log scale)	511	447
Log Exports (MMbf log scale)	291	112
Lumber Production (MMbf lumber tally)	152	297
Pulp Production (M tons)	157	175
Chip Exports (M tons)	69	75
Employment (Average Annual)		
Logging	1,177	874
Sawmills	515	782
Pulp	533	480
Total Direct Employment	2,225	2,136
Total (Direct, Indirect & Induced)	3,471	3,332
Employee Earnings (Million 1994$)		
Direct Earnings	97	93
Total (Direct, Indirect & Induced)	131	125
Gross Business Income (Million 1994$)		
@ 1994 Prices	423	400
with 2% Annual Real Price Increase	515	487

1994 figures are actual statistics for that year. The 2005 scenario was obtained by holding 1994 figures for National Forest harvest, regional lumber production, and pulp production constant, and then factoring in a 114 MMbf decrease in Native corporation harvests. The Brooks & Haynes scenario is described in Brooks and Haynes, 1994.
Decline in pulp employment in the baseline 2005 scenario relative to 1994 is the result of using average employment per ton of pulp production for the 1990-94 period to derive total employment estimates.
Figures may not sum due to rounding.

Commercial Fishing and Seafood Processing

While commercial salmon fishing comprises the bulk of Southeast Alaska's fishing industry, halibut, crab and herring fishing constitute a substantial proportion of the region's total catch (approximately 24 percent in 1994 on value basis). Nonetheless, these fisheries are not directly dependent upon the Tongass National Forest for their sustenance, and they do not readily fall under the definition of "affected environment." Consequently, statistics on commercial fishing presented in this section will be specific to the salmon fishery. Statistics available for the seafood processing industry, however, do not allow for an easy distinction between salmon processors and other firms, and the entire industry will be included in subsequent tables and figures.

Although the profitability of the seafood industry in Southeast Alaska continuously changes, it remains a major component of the regional economy. Taken together, commercial fishing and seafood processing formed the region's largest private industry in 1994. At an estimated 3,545 average annual employees in 1994, combined direct employment in the salmon fishing and seafood processing industries exceeded that in wood products by 61 percent and that in recreation and tourism by 28 percent. State government, Southeast Alaska's largest basic industry employer is concentrated in Juneau while components of the seafood industry are spread throughout the region with a significant presence in virtually every community. Sitka leads Southeast ports in the number of permits fished, and Petersburg residents lead the region in catch and gross earnings.

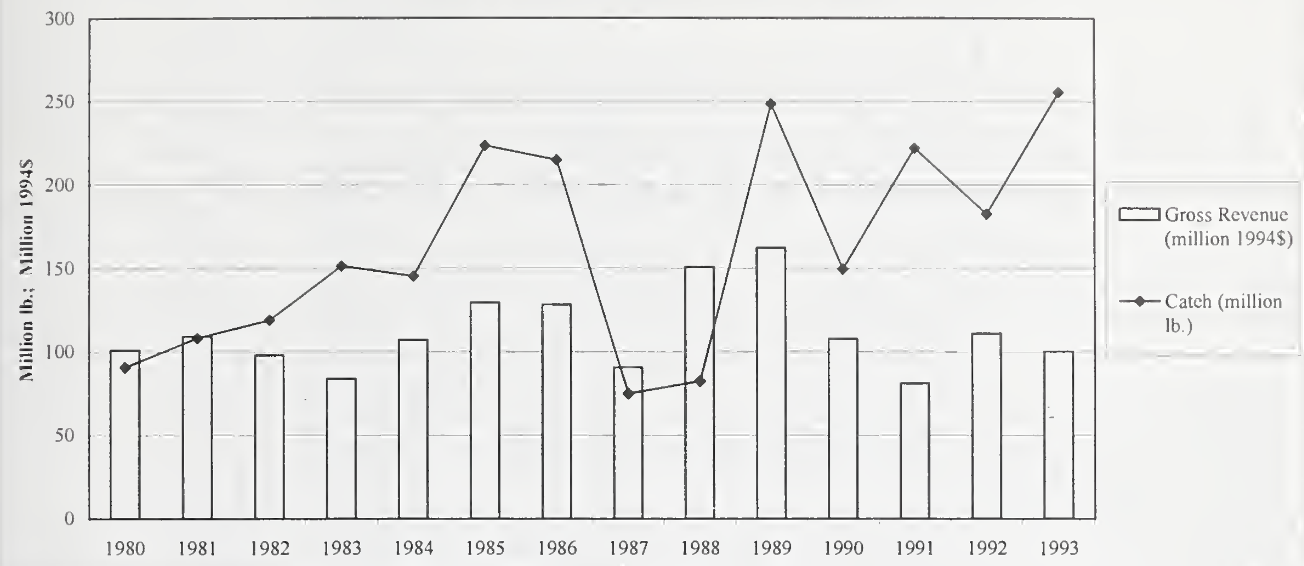
Most fresh and frozen Alaska Salmon is sold in the U.S. and Japan with lesser amounts sold in Europe, primarily to France and the United Kingdom. Canada and Korea also buy significant amounts of fresh and frozen salmon from Alaska. Canned salmon is sold primarily in the U.S. Other markets include the United Kingdom, other European nations, Australia and Canada. World fish consumption far exceeds the productive capability of the Tongass National Forest, and any changes in commercial fish production attributable to forest management will not have a significant effect on market prices. In economic terms, participants in Alaska's seafood industry are "price takers" and subject to wide price fluctuations as a consequence of changes in the international market for seafood products of all types.

Salmon stocks have recovered from their low levels in the early 1970s, and salmon continues to dominate the industry both in the volume and value of catch and in harvest-related employment. Despite overall growth in Alaska's salmon production and worldwide increases in consumption, Alaska's market share of global salmon supply (estimated at 31 percent in 1990) has been falling. The loss of market share is not a function of poor stocks or low supply, but a consequence of the growing acceptability of farmed fish as a source of fresh salmon. The consistent year-round availability and quality of fresh-farmed salmon has made wild Alaska salmon, with its short season and quality and supply inconsistencies, a secondary choice. Seafood processing, another vital component of Southeast Alaska's economy, has also undergone fundamental changes. Of major significance are the increased use of floating fish processing facilities and a trend toward frozen rather than canned salmon.

Value and volume measures of salmon harvest for Southeast Alaska are shown in Figure 3-14 and further enumerated in Table 3-105. In spite of extreme variation from year to year, harvest levels show a definite upward trend since 1980. Gross revenues (in 1994 constant dollars), on the other hand, display no apparent trend. This divergence of volume and value trends is the result of falling prices for Alaskan wild salmon (see "unit values" in Table 3-105), and provides quantitative support for the arguments made in the previous paragraph. In contrast to revenue and catch figures, employment (Figure 3-15) in both salmon fishing and, to a lesser extent, seafood

Figure 3-14.

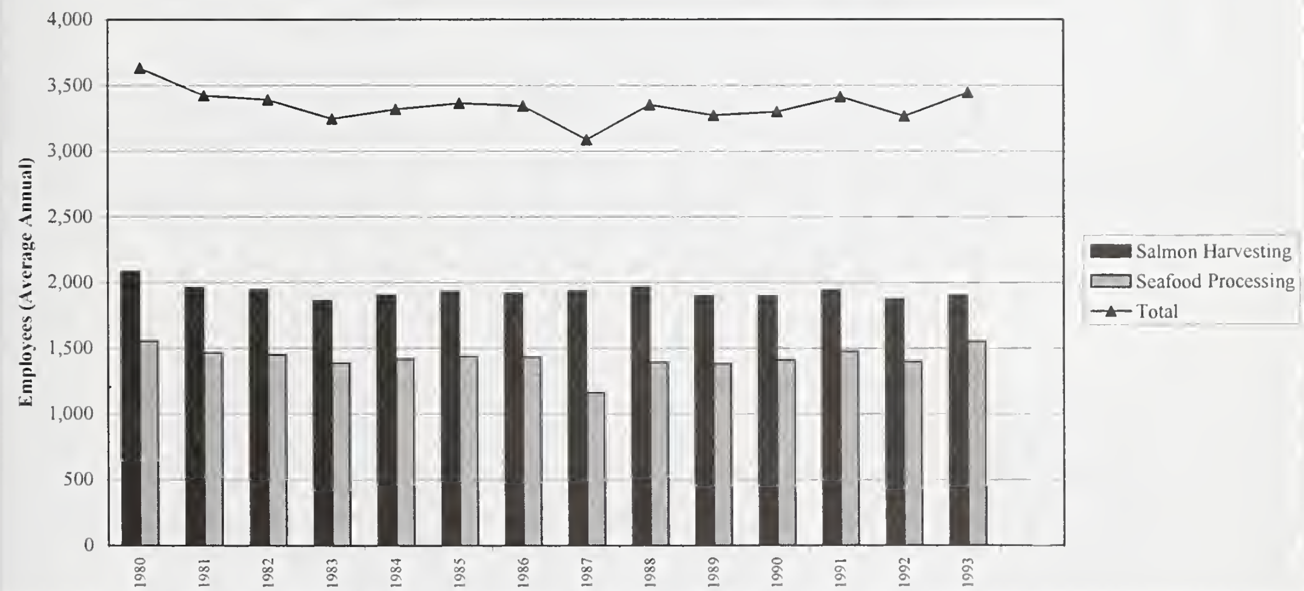
Southeast Alaska Salmon Harvest: Catch and Gross Revenue (Same Axis) 1980-1993



Source: AK Commercial Fisheries Entry Commission.
Gross Revenues are ex-vessel values deflated using the national Producer Price Index (PPI).

Figure 3-15.

Direct Employment in Southeast Alaska Salmon Harvesting and Fish Processing 1980-1993



Source: AK Commercial Fisheries Entry Commission, AK Dept. of Labor.
Salmon harvesting employment derived using average crew size and number of permits (see text).

Table 3-105. Southeast Alaska Salmon Industry Employment and Earnings Estimates

Fisheries Included	Crew Shares and Income Coefficients from McDowell	
	Crew Shares (Average Annual Employee/ Permits Fished)	Income Coefficients (% of Gross Ex-Vessel to Earnings)
SO4D YAKUTAT SALMON SET NET	0.58	0.29
SO1A S.E. SALMON SEINE	1.62	0.52
S03A S.E. SALMON DRIFT GILL NET	0.80	0.29
SO5B S.E. SALMON HAND TROLL	0.25	0.26
S15B S.E. SALMON POWER TROLL	0.80	0.26

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Salmon Harvesting															
Permits Fished	3,448	2,915	2,825	2,670	2,615	2,695	2,613	2,591	2,628	2,515	2,521	2,557	2,462	2,435	--
Catch (million lb..)	90.8	108.6	119.2	151.4	145.5	223.4	214.8	75.0	82.5	248.5	149.6	222.2	182.6	255.6	--
Gross Revenue (million 1994$)	101	110	98	84	107	129	128	91	151	162	108	81	111	101	--
Unit Value of Catch (1994$ / lb.)	1.11	1.01	0.82	0.55	0.74	0.58	0.60	1.21	1.83	0.65	0.72	0.36	0.61	0.39	
Direct Average Annual Employment	2,081	1,961	1,943	1,860	1,901	1,928	1,915	1,931	1,962	1,894	1,892	1,939	1,870	1,896	--
Total Average Annual Employment	2,955	2,784	2,760	2,640	2,700	2,737	2,720	2,742	2,787	2,689	2,687	2,753	2,655	2,692	--
Estimated Payroll (million 1994$)	--	--	--	--	38.7	50.3	49.6	31.3	58.4	73.3	42.9	32.0	43.9	40.6	--
1994$ / Average Annual Employee	--	--	--	--	20,368	26,078	25,918	16,189	29,776	38,708	22,672	16,499	23,477	21,425	--
Seafood Processing															
Direct Average Annual Employment	1,553	1,463	1,450	1,388	1,419	1,439	1,429	1,158	1,392	1,379	1,408	1,475	1,396	1,550	1,646
Total Average Annual Employment	2,981	2,810	2,785	2,664	2,724	2,762	2,744	2,224	2,672	2,648	2,704	2,832	2,680	2,976	3,160
Payroll (million 1994$)	--	--	--	--	--	--	--	--	29.9	33.9	33.4	38.6	33.8	36.5	40.8
1994$ / Average Annual Employee	--	--	--	--	--	--	--	--	21,461	24,577	23,696	26,159	24,183	23,528	#####
Total															
Direct Average Annual Employment	3,633	3,424	3,394	3,247	3,320	3,366	3,345	3,089	3,354	3,273	3,300	3,414	3,265	3,446	--
Payroll (million 1994$)	--	--	--	--	--	--	--	--	88.3	107.2	76.3	70.6	77.6	77.1	--

Source: Alaska Commercial Fisheries Entry Commission, and The McDowell Group, 1989.

Employment estimates for salmon harvesting were obtained using the McDowell methodology and associated estimates (see text for details).

Before 1987, seafood processing is not broken out in AK Dept. of Labor Figures. Figures prior to 1987 which are reported here were estimated using volume of Salmon caught.

All income figures are deflated using the Anchorage CPI. Gross revenue figures for salmon harvesting are deflated using the national producer price index (PPI).

No total is given for indirect employment as multiplier effects in the seafood processing industry will be result in indirect employment in salmon harvesting. Adding indirect employment for harvesting and processing would result in double counting.

processing is remarkably stable. A generally increasing catch using the same work force has, on average, allowed fisherman to maintain real incomes in spite of falling prices (see "1994$ / Employee" in Table 3-105). Alongside the high degree of seasonality and nonresident participation in salmon fishing and processing, the extreme variation in yearly income in this employment category stands out. Nonetheless, the relative size and stability of employment in the industry identifies fishing and processing as an extremely important and apparently sustainable element in Southeast Alaska's regional economy.

A brief explanation of these employment figures is warranted here. Employment and earning statistics published by the Alaska Department of Labor are compiled from quarterly reports of employers who are subject to state unemployment insurance law. Self-employed persons, such as those in commercial fishing are excluded from these figures. Consequently, employment for the salmon fishing industry had to be estimated. The technique used relies heavily upon the methodology and results used by the McDowell Group in their 1989 report on the Alaska seafood industry (McDowell Group 1989). In order to estimate employment levels, surveys were first undertaken to obtain average crew sizes, time spent fishing and preparation time for different fisheries. These figures are then used to estimate the number of employee-years associated with a permit fished in a given fishery. Multiplying this estimate by permits fished yields estimated average annual employee by fishery. Earnings figures are estimated by dividing up net revenues amongst captains and employees in the fishery. It is important to note that profits to captains are not included. This allows for comparability with Department of Labor figures and helps to explain the extremely low yearly earnings estimates reported in Table 3-105. It must be noted that this method yields a best approximation of the economic activity attributed directly to commercial fishing and is subject to some degree of error.

In previous drafts, several assumptions have been used to relate the salmon fishing and seafood processing industries back to the Tongass National Forest. It has been assumed, for example, that 80 percent of Southeast Alaska salmon originate on the Tongass, and thus, 80 percent of the salmon fishing industry is dependent upon the National Forest. The dependence of fish processing employment on the Tongass was derived similarly with the added assumption that salmon represented 60 percent (on volume basis) of the total processed catch. Consequently, 48 percent of seafood processing employment was identified as being dependent upon the Forest. While extremely rough, these percentages help to define the extreme boundaries of potential impacts from forest management. At the same time, however, they tend to simplify what are in fact extremely complex processes which link salmon with the land and with the fishing industry.

Estimates from the fisheries habitat panel assessment and the fisheries environmental effects section of this EIS indicate that forest management activities are anticipated to pose some risks to anadromous fish habitat on the Tongass National Forest (see fish section). However, much of the future of the fishing industry in Southeast Alaska will be dependent upon occurrences outside of the National Forest such as off-shore harvest levels and changes in ocean currents. Due to these and other confounding factors, no reliable projections of salmon harvests were obtainable. Therefore, no significant changes in the fishing industry are expected to result for implementation of any of the alternatives. However, much of the future of the fishing industry in Southeast Alaska will be dependent upon occurrences outside of the National Forest such as off-shore harvest levels and changes in ocean currents. Due to these and other confounding factors, no reliable projections of salmon harvests or jobs were obtainable.

Recreation and Tourism

General recreational use and tourism within the Tongass has more than doubled in the last ten years. This, in turn, reflects a rapid increase in recreational and tourism related activities for all of Southeast Alaska, and economic activity in this industry (including sport fishing and hunting) now accounts for an estimated 2,771 jobs in the region (direct employment only). This figure constitutes approximately seven percent of Southeast Alaska total 1994 employment and is the second largest employment level amongst the region's resources dependent industries. A substantial proportion of this activity, however, does not occur on the Tongass National Forest. In other cases (such as the cruise ship business), linkages with National Forest policy are assumed to exist but are impossible to quantify. The statistics presented in the following paragraphs are related to activity directly occurring on the Tongass. Nevertheless, it must be remembered that the National Forest, and public perceptions of its undisturbed character, plays an important role in bringing out-of-state visitors to Southeast Alaska, who, in turn, will generate jobs and income through activities not directly related to the Tongass. Added to this ambiguity is the fact that economic activity related to recreational use is extremely difficult to accurately quantify. Since tourists spend their money throughout the local economy, there is no single "tourism industry," and no direct measures of tourist related income or employment. Other recreational activities likewise impact numerous different sectors of the economy. And finally, unlike a traded commodity such as timber, there is no direct way to integrate supply and demand to yield a level of consumption or market value for recreational experiences on public lands. As a result of the factors enumerated above, the employment measures and projections of expected use presented below should be seen as tentative estimates whose purpose is merely to flesh out broad trends within the industry and the region. Various assumptions had to be made in order to proceed with the analysis, and each of these has the potential of introducing errors to our estimates. The nature of these assumptions and their impact on the analysis are discussed in detail in the concluding paragraphs of this section.

The basic measurement of recreational activity on the National Forest is the Recreation Visitor Day (RVD), usually obtained through the counting of use permits, through visitor surveys, or through observation. An RVD is 12 hours of recreation use by one individual. The RVDs used in this analysis quantify visitors' use directly related to use on the Tongass. These RVDs are categorized into three distinct groups in accordance with the Recreational Opportunity Spectrum (ROS) classification system. The three groups used in the analysis are a combination the seven ROS classes. These classes are: "Primitive and Semi-Primitive Non-Motorized" (here termed ROS1); "Semi-Primitive Motorized" (ROS2); and "Roaded Natural, Roaded Modified, Rural, and Urban" (ROS3). Each of these categories is discussed separately below.

By far the largest component of recreation use on the Tongass has been in ROS2, or the Semi-Primitive Motorized category. Areas suitable for this activity primarily include natural appearing shorelines, lakes and rivers which provide for semi-primitive experiences, but are classified as motorized due to boat and float plane activity in the vicinity. 1994 estimates indicate that ROS2 class use accounts for approximately 62 percent of all RVDs occurring on the Tongass. The 62 percent figure for ROS2, and estimates for ROS1 and ROS3, are assumed to be constant throughout the time span considered in this analysis and were used to break out levels of usage by ROS class from the raw data which was reported as simple RVDs. The next largest component of general recreational activity is within ROS1. Recreation use in this category is predicated on a natural or natural appearing setting with little evidence of human use and little motorized activity. This category accounts for an estimated 20 percent of recreational activity on the Tongass. The smallest component of recreation use is ROS3 which is estimated to comprise 18 percent of total recreational use. Recreation use in this category occurs in roaded settings where signs of human activity are apparent.

Statistics for Tongass related RVDs along with projected demand and supply relations are shown in Figures 3-16 and 3-17 and are further detailed in Table 3-106. Though the techniques used in their derivation are relatively simple, these statistics require some explanation. Historical recreational activity, shown in Figure 3-16, is the base from which all other statistics are derived and is in the form of simple RVDs (undifferentiated by ROS group). A trend line (based on a linear regression using 1984 - 1994 data) is also shown, and this is used to project future levels of demand for RVDs of all types. When spliced together, these two elements yield a single series composed of past consumption and future demand for RVDs on the Tongass National Forest. This series is shown in the "Total" row in the first part of Table 3-106. It is then used in combination with the ROS class shares given in the previous paragraph to break out RVDs by ROS groups 1, 2, and 3, and these estimates are, in turn, shown in the columns of Figure 3-17. The horizontal lines correspond to the 1994 supply of recreational settings within each ROS class and are taken from a geographical database describing the Forest. Note that in the past no level of use within a given ROS category has met or exceeded its 1994 available supply. However, in 1996, the projected number of RVDs in ROS2 exceeds current estimated supply, and, given a linearly increasing projection of demand for a fixed resource, this shortfall in ROS2 increases as the years pass. Note that this predicted shortfall is based on current levels of supply and that further decreases in ROS2 settings due to competing forest uses will exacerbate the shortfall.

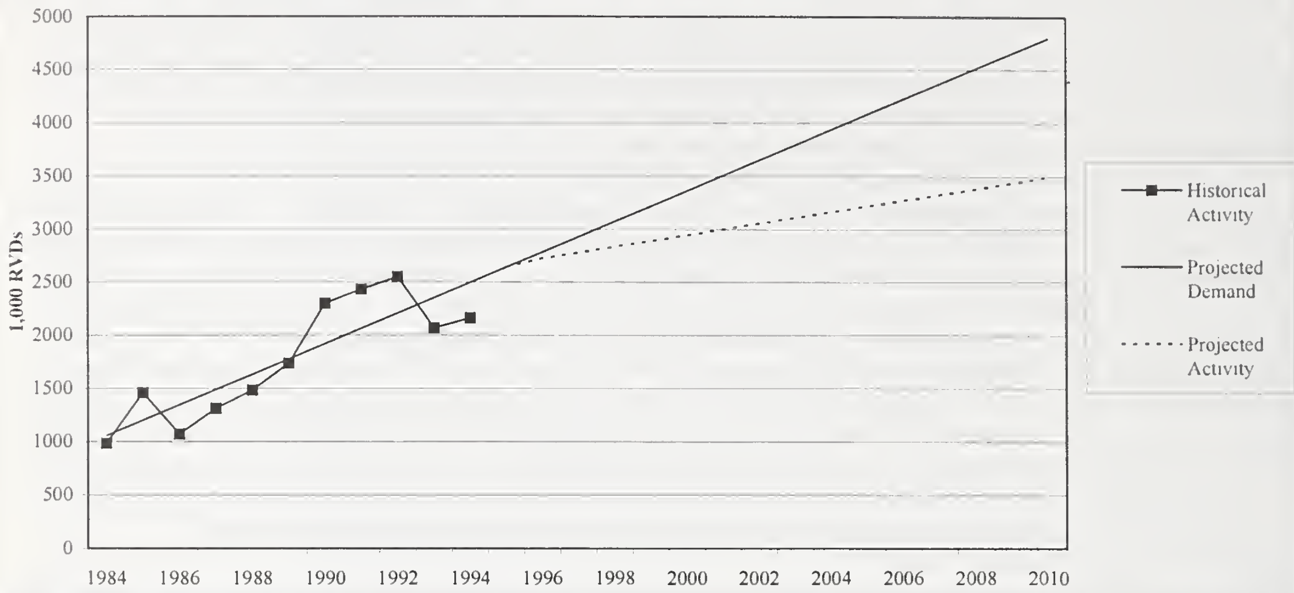
Recreational use upon public lands is not a market good, and, where supply is binding, use restrictions rather than price increases are the most likely result. It is here assumed that RVD use within a certain ROS class will not exceed supply within that class (for convenience we take supply to be the current level available, but alternative supply levels will be treated in the Affects Analysis portion of this report). ROS2 is the only class in which supply is binding over the period considered, and by constraining ROS2 related RVDs to their 1994 supply level, we derive a projected level of use for the Forest. This projected consumption of RVDs is shown in the dotted line in Figure 3-16 and further broken out by ROS groups in Table 3-106. It represents a baseline projection of recreational activity on the Tongass National Forest under the assumption of no change in current availability of recreational settings.

Several additional steps are necessary to translate the number of RVDs into employment levels for Tongass related recreation. In the first step, visitor survey data outlining cash expenditures was used in conjunction with a regional economic model (IMPLAN) to derive the average amount of employment generated per RVD in 1990. Visitor data were taken from a comprehensive visitor survey conducted in 1988 by the Data decisions group. The actual figure used for employment was 0.00074 jobs/RVD. By multiplying this number by historical and projected RVDs on the Tongass, we obtain the Tongass related direct employment estimates shown at the bottom of Table 3-106. This approach assumes that the average amount of employment generated by a single RVD is constant over time and that this number is the same for both Tongass related recreation and for the region as a whole. Although these assumptions may not be exactly how the market would respond, the assumptions were unavoidable.

In addition to the "Direct Employment" category, Table 3-106 shows a "From Non Resident" employment category. Non resident employment refers to those jobs generated by expenditures from out-of-state visitors and is comparable to an export industry which brings new money into the region. Consequently, employment generated by non resident expenditures in the recreation and tourism sector creates new wealth

Figure 3-16.

Historical and Projected Recreational Activity on the Tongass National Forest in RVDs

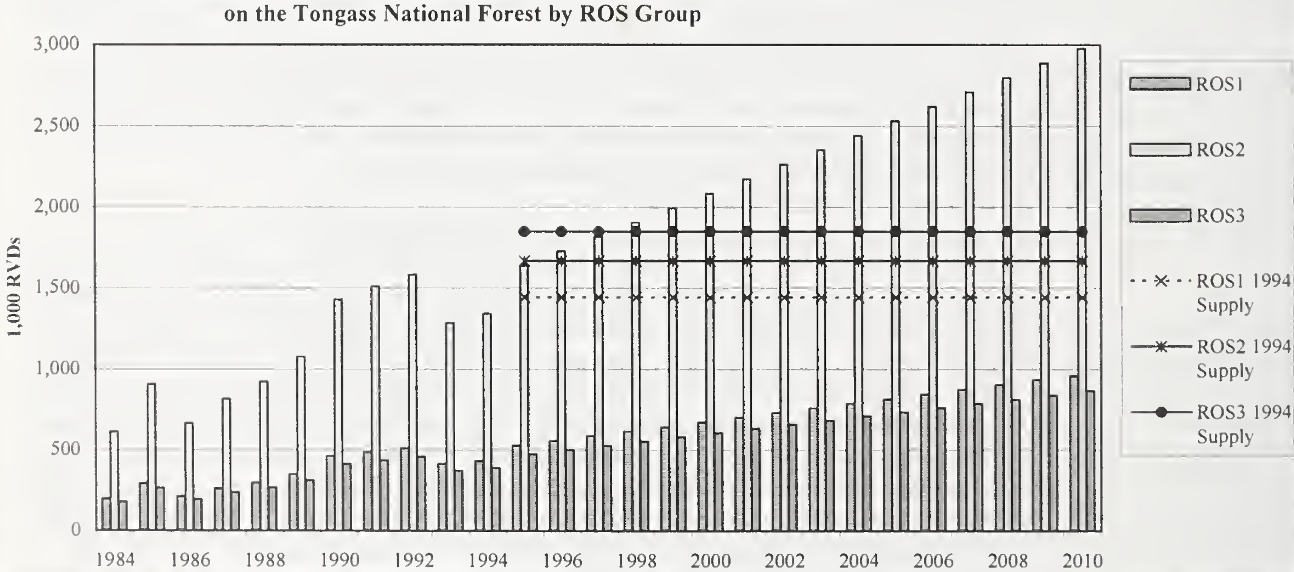


Source: USDA Forest Service

See text for definitions and explanations.

Figure 3-17.

Historical Consumption, Projected Demand and 1994 Supply for Recreation Activity on the Tongass National Forest by ROS Group



Source: USDA Forest Service

Table 3-106. Tongass Related Recreation and Tourism: Historic and Predicted Consumption in Recreation Visitor Days (RVDs)

Consumption to 1994 and Projected Demand for Tongass Related Recreation (1,000 RVDs)

(1,000 RVDs)	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	2000	2005	2010
ROS1	207	307	225	276	312	365	484	511	536	435	455	555	706	857	1,008
ROS2	622	922	676	828	937	1,095	1,451	1,534	1,609	1,305	1,364	1,664	2,117	2,571	3,024
ROS3	158	234	172	210	238	278	368	390	409	331	346	423	538	653	768
Total	987	1,463	1,073	1,315	1,487	1,738	2,303	2,435	2,554	2,071	2,165	2,642	3,361	4,080	4,800

Available Recreation Opportunities
(RVDs by Class in 1994)

(1,000 RVDs)	ROS1	1442.7
	ROS2	1668.3
	ROS3	1851.1

Projected Consumption of RVDs by Group

		1995	2000	2005	2010
(1,000 RVDs)	ROS1	555	706	857	1,008
	ROS2	1,664	1,668	1,668	1,668
	ROS3	423	538	653	768
	Total	2,642	2,912	3,178	3,444

Historic and Projected Employment Generated in Average Annual Employment

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	2000	2005	2010
Direct Employment	730	1,082	793	972	1,100	1,285	1,703	1,801	1,889	1,532	1,601	1,954	2,154	2,351	2,548
From Non Resident	321	475	349	427	483	565	748	791	830	673	704	859	946	1,033	1,119
Total from Non Resident	424	629	461	565	639	747	990	1,046	1,098	890	930	1,135	1,251	1,366	1,480

Source: USDA Forest Service.
See text for definitions and explanations.

and development opportunities for Southeast Alaska. Resident recreational activity, on the other hand, brings no new money to the region, and thereby does not expand the local job base. Since nonresident visitors to the Tongass National Forest account for an estimated 46 percent of total use, nonresident generated employment figures are considerably less than those for direct employment. The last row in Table 3-106, entitled "Total from non resident" quantifies the total effect of nonresident recreation and tourism expenditures on employment in Southeast Alaska. This occurs through the previously mentioned "multiplier effect" in which visitor expenditures create direct employment, and the wages paid to these new employees, in turn, generate other jobs in the regional economy. A reduction in out-of-state recreational activity due to decreased recreational opportunities (ROS settings) will result in a net economic loss to the region. Local residents, on the other hand, are assumed to spend their money elsewhere in Southeast Alaska, and no net loss in economic activity is incurred.

This is not to say that the effect is neutral. Local residents who would wish to use the Forest but are unable to must choose a less preferred alternative (say bowling), and thus lose some of the value associated with the recreational experience. Likewise, while no net loss in employment is entailed in the long run, some employees catering to the resident recreation and tourism trade will lose their jobs. The hardships faced by these individuals will be very real even if they are not reflected in regional employment totals.

There are numerous potential sources of error in the foregoing analysis, and each highlights both key issues surrounding recreational use on the Tongass National Forest and the difficulty in deriving and predicting economic measures associated with this use. Some of the most important sources of error are as follows:

1. The RVDs used in the analysis do not reflect total recreational use or value associated with the forest. Viewing opportunities from cruise ships and other water-borne activity are not included. Likewise, the role of the Tongass National Forest as a general draw for out-of-state tourism is not addressed. In the first case, the value of viewing an undisturbed coastline from a boat is extremely difficult to measure. Moreover, it is impossible to define this activity as a "use" in the same way that RVDs actually occurring on National Forest land may be defined. A final complication lies in the importance of location; clearcuts occurring along cruise ship corridors will be noticed more than those occurring elsewhere. In the second case, the Tongass National Forest must be viewed in combination with other recreational opportunities in the region. Out-of-state visitors, for example, will often divide their time between activities on the Tongass National Forest and those available elsewhere in Southeast Alaska. While National Forest related recreation may not comprise all, or even a majority, of their activity, the availability of Tongass based recreation opportunities may still be a key factor in their decision to come to the region in the first place. The main attraction for visitors to Southeast Alaska is its pristine nature, and public perceptions of Tongass National Forest management will affect this attraction. In either of the cases discussed in this paragraph, the result will be a tendency to underestimate the economic value of Tongass related recreation and tourism in the statistics presented above.

2. The use of a linear projection (i.e. the assumption that Tongass-based recreation activity will increase in the future at the same rate as it has in the past) is problematic when used with long projections into the future. Numerous factors will affect the future demand for recreation. These include general economic trends, trends in public tastes, changes in relative costs (airfare to

Juneau for example), and temporary factors such as the weather, gasoline shortages, fear of international terrorism, ferry strikes, and other local, national and international factors. Linear projections ignore all of these elements and assume that steady growth (or decline) will continue indefinitely. More complex methods of estimating future recreation demand on the Tongass using population and income trends have been considered in the past. In this case, however, these methods serve only to increase the complexity of the analysis while yielding no gains in accuracy. Consequently, the linear projection was used in spite of its shortcomings. Nonetheless, readers must use their own judgment (including common sense predictions of future developments) in assessing probable trends in recreational use on the Tongass. While the error associated with the linear projection could go either way, it is likely that the bias will lead to an overestimation of recreation demand in the long-run.

3. Another potential source of error is the fact that a one-to-one relationship between RVDs and ROS class opportunities is assumed. If, for example, 200 RVDs in ROS1 are demanded but only 150 ROS1 settings are available, 150 RVDs in ROS1 are assumed to take place. A reduction of 10 ROS1 settings will likewise result in a equal reduction in RVDs. This assumption ignores the possibility of people substituting different recreational types for the one in short supply. If opportunities in ROS2 (the most common RVD type) are unavailable in the future, it is reasonable to assume that individuals will substitute using ROS1 or ROS3 settings. Some value to consumers will be lost as they opt for these less preferred alternatives, but the economic activity generated by recreation and tourism need not be negatively impacted by the shift. Trying to adequately account for these substitution effects, however, is difficult and well beyond the scope of this analysis. By assuming no substitution between recreation types, an overestimation of the negative economic impacts of reduced recreational activity on the Tongass will result.

4. Location has not been considered in this analysis, and recreation settings within a given ROS class are considered to be equivalent regardless of where they are located. However, in terms of both access and quality, location is an important factor in determining the relative value of recreational sites. This is especially true for local residents who may have a number of favorite or customary places for recreation. If these places are affected by alternative uses, local residents may find that they have to travel much farther to find a comparable site and may opt to forego the trip altogether. Consequently, a local reduction in recreational settings will result in a decline in recreation activity even if comparable settings are available elsewhere on the Forest. In this case, the error leads to an underestimation of the economic impacts resulting from changes in the supply of recreational opportunities. An added aspect, which is not measured in figures for RVDs and employment, is that residents who are forced to visit less desirable or convenient sites suffer a genuine loss in welfare, even if this loss cannot be quantified.

5. The final potential source of error considered here is related to the derivation of employment figures from reported RVDs. In addition to the difficulty of differentiating recreation related employment from total employment in the services sector, there are problems associated with assuming that the number of jobs per RVD is constant over time. Changes in the types of recreation undertaken by residents and visitors will, in turn, result in changes in the amount of employment generated by these activities. A shift from ROS2 type recreation to ROS3, for example, may result in a decrease in float plane business but an

increase in ferry traffic and other automobile related services. There is no reason to believe that these impacts will necessarily balance out. Consequently, a change over time in the composition of recreational activity will change the amount of employment generated by aggregate recreational activity. Other changes, such as a shift in the average daily expenditure of visitors or the technology used to supply recreational services, will likewise change the jobs per RVD figure. The error associated with the assumption of a stable amount of employment generated per RVD could be either positive or negative.

The foregoing discussion highlights the difficulty in measuring and predicting economic activity associated with recreation on the Tongass National Forest. We do not assume that the errors mentioned above necessarily balance out, and readers must use their own judgment as to whether the estimates given here are biased one way or the other. Nonetheless, two important facts are evident in Figures 3-16 and 3-17 and Table 3-106: 1) recreation on the Tongass has been growing at a very fast rate over the last ten years, and 2) ROS2 type recreation and tourism is by far the most common type, and demand within this category will very soon exceed the available supply of suitable recreational settings even if no more settings are lost to competing forest uses. This will, in turn, constrain benefits to resident users, and serve to limit, to some extent, the economic activity generated by resident and nonresident recreation and tourism in Southeast Alaska.

Hunting and Sport Fishing

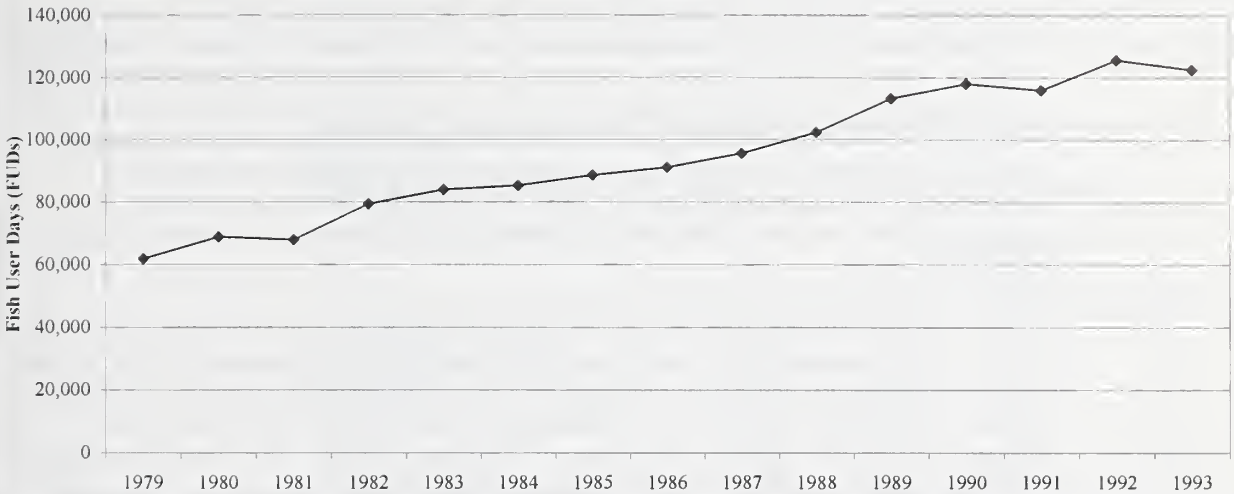
Hunting and sport fishing represent a large proportion of total recreation activity on the Tongass National Forest. Figures 3-18 and 3-19 show historical levels of activity in sport fishing and hunting respectively. Sport fishing activity is obtained from the ADF&G sport fishing survey and is reported in fish user-days. Hunting activity, on the other hand, is reported in RVDs and was obtained from RIM database which is maintained by the Forest Service. These numbers are not directly comparable. Sport fishing includes trout and steelhead fishing occurring within the National Forest as well as a share of salmon fishing which is thought to represent the proportion of Southeast Alaska salmon originating in National Forest streams. Upward trends in both activities are quite pronounced. In the case of sport fishing, the majority of recent growth has reportedly been generated by non-resident fishers, indicating the increasing importance of this activity as a source of new money and employment for the region.

Mining and Mineral Development

Mineral exploration and mining have been a part of life in Southeast Alaska for over 120 years. Today, the mining industry is exploring new areas for potential mineral deposits and is revisiting historic mining areas using modern exploration techniques. There are 13 identified mineral deposits on the Tongass National Forest that appear economically viable under today's market conditions. The present net value of these 13 deposits is estimated at 25.6 billion dollars. Today, mining development activities are centered primarily on the Quartz Hill molybdenum site in Misty Fiords, the Greens Creek silver and gold mine on Admiralty Island, and the Kensington mine north of Juneau are currently under active consideration.

Figure 3-18.

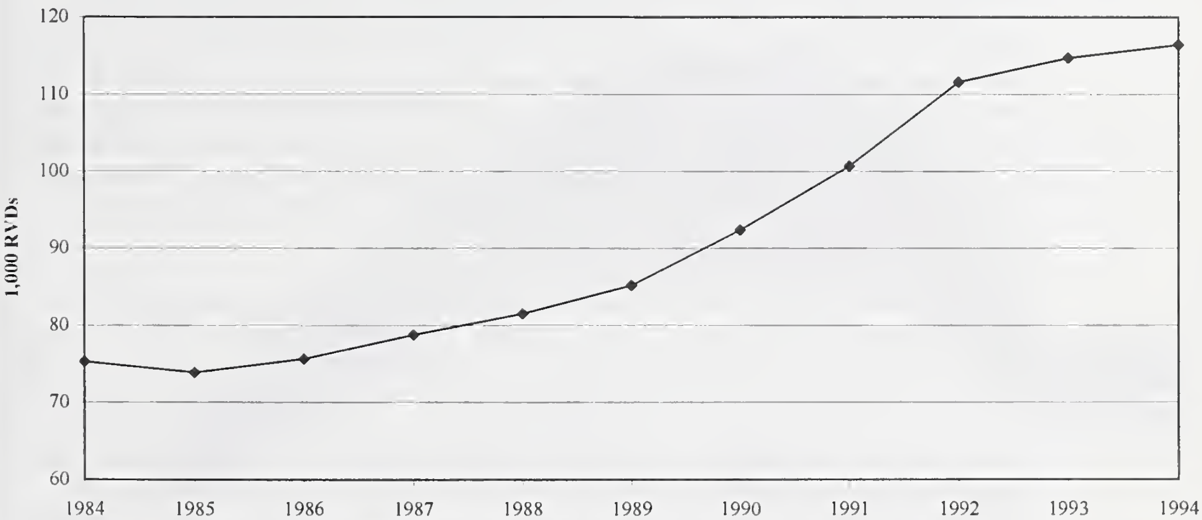
Sport Fishing on the Tongass National Forest 1979 - 1993



Source: ADF&G Sport Fishing Study.

Figure 3-19.

Hunting Activity on the Tongass National Forest, 1984-1994



Source: USDA FS.

One hundred sixty-three workers were directly employed by the mining industry in 1994, down from a recent peak of 342 employees in 1991 (see Figure 3-20 and Table 3-107). 1994 mining-related indirect employment is estimated at 120 workers, yielding a total figure of 283 jobs generated in Southeast Alaska by the mining industry in that year. At approximately $60,000 per year, employee earnings are twice the regional average. In 1994, direct employee earnings for the industry stood at $9.8 million and total earnings at $17.1 million. Mining employment in the region is concentrated among only a few operations, the Greens Creek mine being chief among them.

The Greens Creek project is a major metals mine containing silver, gold, zinc and lead on the northwest end of Admiralty Island, approximately 18 miles from Juneau. Exploration of the site began in 1973 and the mine started full operations in 1989. Greens Creek is the largest silver mine in North America, producing up to 100 tons of ore per day. At its peak in 1990-91 the mine employed approximately 265 workers with an estimated payroll of $13.8 million (1994$), making it Juneau's largest private employer. Mine workers commuted from Juneau daily via a work boat to Young Bay on Admiralty Island. The Greens Creek mine closed temporarily in 1992, but is expected to be operational again by 1997.

The Quartz Hill molybdenum deposit in Misty Fiords National Monument was discovered in 1974 and is considered to be one of the largest such deposits in the world, containing as much as 10 percent of the world's known reserves. Molybdenum is used as a hardening agent in the production of steel. If the tailings disposal issue can be resolved, and molybdenum values increase, development of the mine is likely. The mine could produce 80,000 tons of ore per day through an open pit mine operation, and employ 850 to 900 people, most of whom could commute from Ketchikan. Expected life of the mine is predicted to be a minimum of 70 years.

The Kensington property lies within the boundaries of the City and Borough of Juneau, approximately 45 miles north of Juneau on Lynn Canal and is mostly on National Forest System Lands. Coeur Alaska, a division of Coeur d'Alene Mines, is planning a 4,000 ton per day operation over a projected mine life of 12 years. Once in full operation, the Kensington Mine would employ 340 workers, with an annual payroll of approximately $12.9 million. A 250 person camp would be constructed at the mine site and workers would be transported to and from Juneau by helicopter. An environmental impact statement was completed by the Forest Service, Environmental Protection Agency, and U.S. Army Corps of Engineers in early 1992. These agencies are currently preparing a Supplemental EIS to analyze impacts of proposed changes to the project. In addition, Coeur Alaska is working on obtaining permits from other agencies. Construction is planned for late summer, 1996.

The Alaska-Juneau (AJ) Mine, located near downtown Juneau, would recover approximately 350,000 ounces of gold annually for a minimum projected life of 13 years. Echo Bay Mines, Ltd. of Edmonton, Alberta is obtaining permits to operate the AJ mine which is on property owned by the City and Borough of Juneau and Alaska Electric Light and Power Company (AELP). The City and Borough would earn approximately $3 million annually in royalties, depending on the price of gold. Once in production, the AJ mine would employ 450 workers operating three shifts year round. These workers would earn approximately $20 million in annual payroll. The Environmental Protection Agency is the lead agency in preparing a Supplemental Environmental Impact Statement to analyze the effects of submarine tailings disposal. If the tailings issue can be resolved, development of the mine could occur.

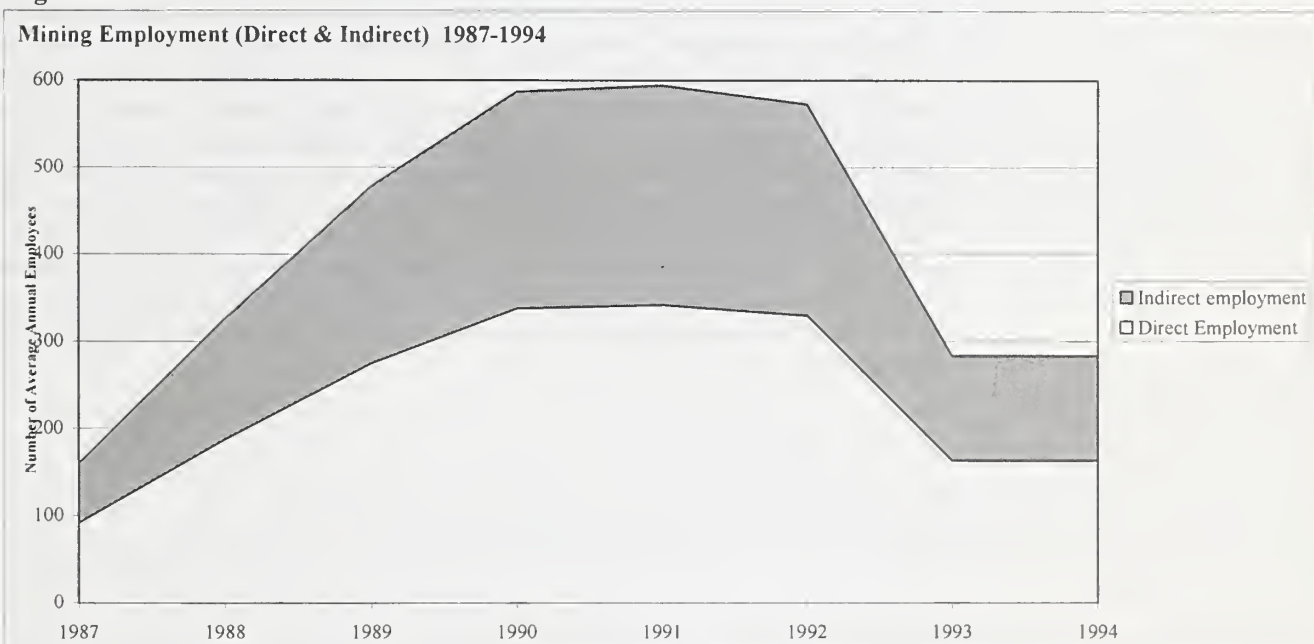
In general, the short to medium-term prospects for Southeast Alaska's mining industry appear to be good, but much will depend upon whether prices for precious metals and other minerals can support Alaska's high exploration, development and production costs. Should all the potential mining operations discussed above actually open, the resulting eleven-fold increase in direct employment and related figures (see Table 3-107) will have a major positive impact on the regional economy, especially in Juneau where most of the new activity will be located. The mining industry, however, is based upon a non-renewable resource. Once the viable life-span of a project is over, or prices fall below levels allowing for profitable operation, these mines will close. Due to the high concentration of mining activity in only a few large projects, such closures will be quite disruptive both for mine employees and for other companies servicing the mining industry.

Table 3-107
Mining Employment, 1994 and Full Development Scenario

		Potential Sites			
	1994	**Quartz Hill**	**Kensington**	**AJ Mine**	**Total**
Direct Employment (Average Annual)	163	875	340	450	1,828
Indirect Employment	120	648	252	333	1,353
Total employment	283	1,523	592	783	3,181
Direct Earnings (mill. 1994$)	9.81	52.05	20.22	26.77	108.73
Indirect Earnings	7.26	38.51	14.97	19.81	80.46
Total Earnings	17.08	90.56	35.19	46.57	189.19

Source: AK Dept. of Labor and others (see industry subsection for details).
Total is for all potential sites listed in text and current 1994 employment levels. Earnings were calculated using an average mining earning estimate of $59,481/year (in real 1994 $).

Figure 3-20.



Source: AK Dept. of Labor. Multiplier used to derive indirect employment obtained from the IMPLAN regional economic model.

Forest Receipts and Payments to State

Twenty-five percent of all moneys received by the Tongass National Forest is paid to the State of Alaska. These funds are then distributed to the communities of Southeast Alaska to augment public school and public road budgets. Total receipts for the Tongass National Forest are shown in Figure 3-21 and are further described in Table 3-108 (all numbers are given in 1994 dollars). The most striking aspect of the chart is the extreme variation in revenues received by the Forest. While 1980-94 average income is approximately $19 million, yearly income over that period has ranged from approximately $46 million in 1980 to -$2.6 million in 1987. (Tongass receipts in FY 1987 were negative due to Comptroller General Decision B-224730 of March 31, 1987 to retroactively implement the emergency rate redeterminations for short-term sales. Without the reduction, Tongass receipts would have been positive by $2.1 million. As a result of the negative receipt, no payments to the State of Alaska were made in that year.) Later peaks occur in the boom years of 1990 and 1991, but 1994 also posted one of the highest revenue years on record in spite of declining harvest volumes. Average payments to the State of Alaska were $4.8 million over the 1980-94 period, and 1994 figures stood slightly over $8.7 million

The lack of a close correlation between harvests and forest revenues is a result of the fact that Tongass revenues are comprised of various sources, amongst which revenue from timber sales is significant but does not comprise the majority. Total forest revenues can be broadly broken down into two categories: 1) “forest receipts” which are here defined as actual cash payments received by the National Forest; and 2) “capital improvements” which are broadly defined as capital goods received by the forest usually in lieu of payment. Since 1980, forest receipts have comprised, on average, about 13 percent of total forest revenues (Table 3-108). Capital improvements, on the other hand, constitute over 86 percent, and are thus the driving force behind revenues and subsequent payments to the State of Alaska. Yearly figures for revenues within these two categories are shown in Figure 3-22 (prior to 1977 capital improvements were not included in yearly forest revenue accounts).

Almost 90 percent of forest receipts are comprised by revenues from timber sales. Other revenue sources within this category are recreational user fees, payments for power line right-of-ways, fees paid by mineral developers, and other land use fees. At 80 percent of total capital improvements, purchaser road credits is the largest revenue source both within this category and within total forest revenue. These credits represent road construction expenditures undertaken primarily by logging firms which are then reimbursed by the National Forest in the form of reduced timber sale prices. The roads and related facilities which remain after harvest is completed are the property of the federal government. These assets, in turn, decrease future management costs and allow easier access for all forest users. Other capital improvements include investments in forest stand regeneration and improvements or other silvicultural activities which are aimed at either augmenting the future sale value of forest stands or meeting other forest objectives.

Table 3-108
Tongass National Forest income and payments to State of Alaska

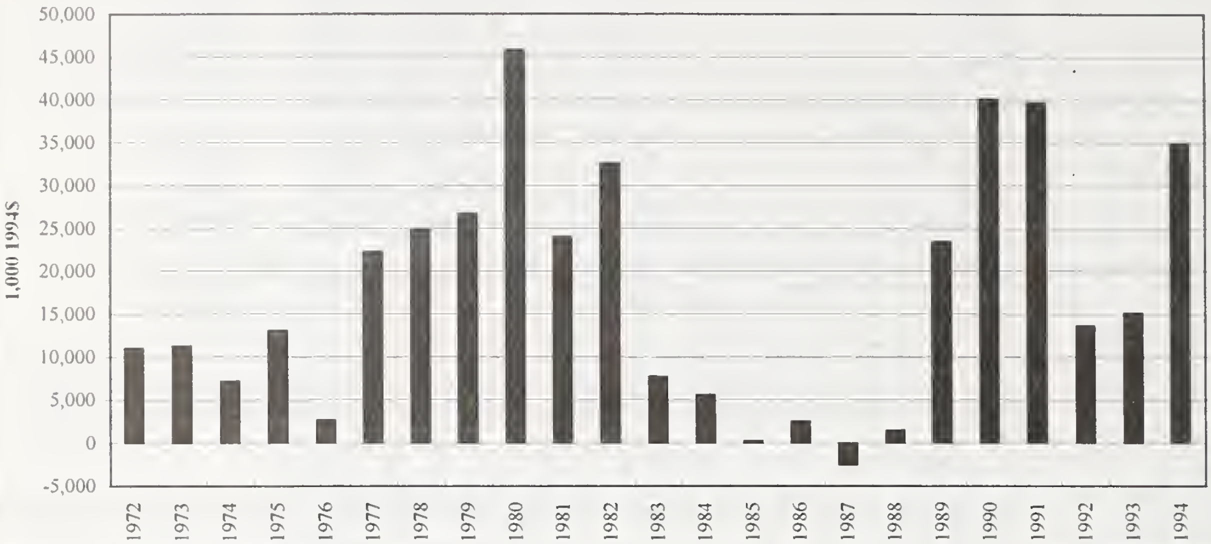
(1,000 1994$)	1980-94 Average	Share	1994	Share
Forest Receipts				
Timber	2,237	11.8%	5,247	15.0%
Other [1]	306	1.6%	906	2.6%
Total	2,544	13.4%	6,153	17.6%
Capital Improvements				
Road Credits	13,125	69.2%	22,914	65.6%
Other [2]	3,288	17.3%	5,838	16.7%
Total	16,413	86.6%	28,751	82.4%
Total Forest Income	18,957	100%	34,905	100%
Payments To State of Alaska	4,782	25%	8,726	25%

Source: USDA Forest Service
Figures adjusted for inflation using U.S. producer's price index (Economic Report to the President). Forest Receipts are actual payments received by the forest. Capital Improvements are capital goods (e.g. roads) received.
(1) Includes recreation and other user fees.
(2) Includes CWKV funds (silviculture and stand improvement) and salvage funds.

Various factors will determine future revenues from the Tongass National Forest. Harvest volumes, international market prices, species and log quality mixes, and harvest costs will influence timber revenues and thereby forest receipts. In as much as purchaser road credits and silvicultural activity are correlated with timber harvest, revenue from capital improvements will depend upon annual sale and harvest volumes. If the past is any guide, however, there is little reason to expect harvest and capital improvements to be closely correlated in the future (see Figure 3-22). This is further evidenced by the fact that 1994 capital improvement revenues posted a 75 percent gain over the previous year in spite of a 15 percent decline in total harvest volume. As a result, the sort of baseline projections provided for the timber industry earlier in this report are not feasible for National Forest revenues and payments to the State of Alaska because capital improvements are not adequately predicted by expected (or assumed) levels of harvest or product prices. The Forest Plan Revision planning alternatives, however, do provide a thorough accounting of projected revenues, and this topic will be discussed more fully in the affects analysis given in the next section of this document.

Figure 3-21.

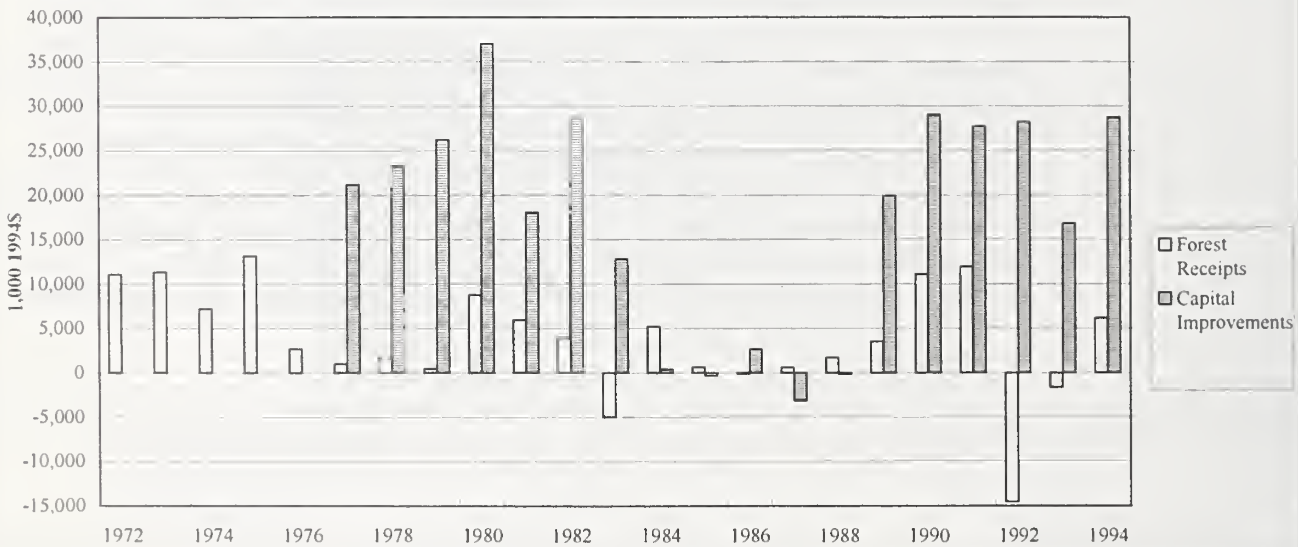
Tongass National Forest Total Net Real Income 1972-1994



Source USDA Forest Service
Adjusted for inflation using the U.S producer's price index in 1994 $(Economic Report to the President)

Figure 3-22.

Tongass National Forest Real Income by Revenue Category 1972-



Source USDA Forest Service
Forest Receipts include revenues from timber sales, recreation fees and other user fees Capital improvements include purchaser road credits, CWKV (silviculture & stand improvement) funds and salvage funds Adjusted for inflation using the U S producer price index (Economic Report of the President) Prior to 1977, purchaser road credits and other capital improvements were not included in Tongass income accounting

Environmental Consequences

Introduction

This section describes the expected direct and indirect economic effects of each of the nine forest plan alternatives. The analysis is divided into two main sections: impact analysis and efficiency analysis. Impact analysis refers to the estimation of employment levels and income resulting from the adoption of a given alternative. Efficiency analysis attempts to measure all of the costs and benefits to society, both future and present, of a planning alternative. These benefits are not restricted to cash transactions, but also include non-market benefits such as consumer surplus. The concepts and methodologies used in each of these analyses are described in detail in the following subsections. In general, it must be remembered that impact and efficiency analysis measure different things and are not directly comparable. Planning alternatives with positive impacts on jobs and income will not necessarily entail high benefits under efficiency analysis. This is because impact analysis views employment as a benefit, while efficiency analysis views wages to employees as a cost which reduces the net benefits to society.

Timber employment fluctuates the most between the alternatives in the current analysis. Recreation and tourism, mining and salmon harvesting, while important in the calculation of both employment levels and the values associated with efficiency analysis, are not greatly affected by the differences in the alternatives. Recreation and tourism employment is expected to increase over the next ten years in all alternatives, however, only minor differences in the amount of increase are expected. There will likely be sufficient capacity to meet all of the projected ROS1 and ROS3 demand over the next ten years with only minor changes in recreation capacity due to timber harvest anticipated. The projected demand for ROS2 will be limited by the current capacity, future ROS2 capacity is unlikely to increase. In the case of mining, no change across the planning alternatives is anticipated. Since none of the alternatives will withdraw lands from mineral entry, the adopted forest plan will not preclude the development of those mines projected to open or reopen in the next ten years.

Effects upon salmon harvesting are more problematic. The risk of adverse effects from timber harvest on stream productivity is recognized (see fish section). Additionally, actual salmon production and harvest could fluctuate greatly due to factors other than National Forest management, such as ocean currents, high seas interception, weather conditions and changes in commercial fishing regulations. Providing quantifiable measures of these effects is extremely difficult. For reasons outlined in the subsequent section on salmon harvesting, none of the proposed alternatives are expected to have a measurable impact on commercial fisheries employment over the next ten years. Long-term impacts are expected, but they are expressed in terms of risk and are not easily translated into expected catch and employment levels.

Since timber, and recreation and tourism, are the only resource-dependent outputs expected to vary between the alternatives, they are the only resources included in the efficiency analysis. For both resources, net willingness to pay (or consumer surplus) is used to calculate the values used in the analysis. While existence values and other related values are undoubtedly a major component of the total value society derives from the Tongass, no reliable estimates were available for this analysis. The nature and potential importance of these values is discussed in more detail in the section on efficiency analysis, but it should be remembered that any dollar measure of social benefits appearing in this report excludes these values.

Economic Impacts Analysis

Estimations of direct and total employment and income levels for the resource-dependent industries projected for each alternative are presented below. These estimates are a decadal average of expected annual employment for the 1995 to 2005 period. In most cases, estimates represent the amount of employment and income which can be expected in the year 2000. Levels for timber and recreation and tourism employment were derived by first calculating expected levels of outputs and then multiplying by the average number of jobs generated by each respective output. For timber, expected levels of logging, lumber production and pulp production were used in conjunction with the average number of jobs generated per unit of output (MMbf equivalent) within each category. In recreation and tourism, Recreation Visitor Days (RVD's) were used in combination with the jobs per RVD estimate derived from the IMPLAN regional economic model and which was used in the previous section of this document ("Economic Affected Environment"). In salmon harvesting, 1994 levels of employment and income were used as an estimate for future employment in this industry. In mining, two additional mines (Greens Creek and Kensington) were assumed to be operating in the year 2000 resulting in an expected employment level of 810. These mines are expected to be operating under all of the alternatives.

Summary

Tables 3-109 and 3-110 summarize expected average employment and income levels for the next ten years. These estimates include employment generated by National Forest activities as well as state, private and other federal activities, including non-Tongass related salmon harvesting, timber harvests on private and state lands, and non-Tongass related recreation and tourism activity. While Table 3-109 assumes that all acres designated in the annual sale quantity (ASQ) in each plan will be cut, Table 3-110 assumes that only those acres within the Non-Interchangeable Component I (NIC I) economic classification will be cut (see timber section for a discussion NIC I). Unless a large increase in timber prices occurs in the next ten years, the NIC I figures are a more accurate estimate of harvest levels. In terms of employment generated, the alternatives range from Alternative 1, which assumes no harvest on the Tongass National Forest, to Alternative 7, the most timber-intensive of the alternatives. Total direct employment levels are further displayed in Figure 3-23. Under the assumption that the total ASQ is harvested (Table 3-109), Alternative 1 yields a total of 6,518 direct jobs in the resource dependent industries included in this analysis. The total for Alternative 7 is 9,310, 43 percent higher than that for Alternative 1. Most of the difference between these two extremes (2,792 jobs) is caused by changes in timber related employment. Estimates under the assumption of NIC I harvest only are slightly lower but mirror the total ASQ harvest levels closely. Recreation and tourism employment, in contrast to timber employment, shows much less variation across the alternatives, with a difference between high and low employment levels of only 58 jobs. For reasons discussed elsewhere, mining and salmon fishing employment are assumed to be constant in this analysis.

With the exception of Alternative 1, all the alternatives show higher direct employment levels than the 1994 level, and this is true even with alternatives that register substantial decreases in timber related employment. There are two reasons for this, both of which are essentially independent of the Forest Plan alternatives. The first is the assumption of an additional 647 mining jobs resulting from the operation of the Greens Creek and Kensington mines in the coming years regardless of planning decisions. The second is an average increase of 722 recreation and tourism related jobs in all planning alternatives relative to the 1994 level. This is the result of a combination of projected strong increases in recreation and tourism demand and currently unused recreation capacity in groups ROS1 and ROS3. Consequently, 1994 is not the best baseline for

Table 3-109
Employment and Income Levels--Total ASQ (1995-2005 Average)

Direct Employment and Income

	1994	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Direct Employment (Average Annual Employment)										
Wood Products	2,225	297	2,478	1,760	1,070	1,033	2,055	3,147	2,049	2,563
Recreation/Tourism	2,771	3,520	3,500	3,500	3,510	3,510	3,500	3,460	3,500	3,470
Salmon Harvesting /1	1,899	1,899	1,899	1,899	1,899	1,899	1,899	1,899	1,899	1,899
Mining	163	810	810	810	810	810	810	810	810	810
Total	7,058	6,521	8,682	7,971	7,284	7,249	8,261	9,313	8,253	8,738
Direct Earnings (Million 1994$)										
Wood Products	97	13	108	76	46	45	89	137	89	111
Recreation/Tourism	86	109	108	109	109	109	108	107	108	107
Salmon Harvesting /1	41	41	41	41	41	41	41	41	41	41
Mining	10	48	48	48	48	48	48	48	48	48
Total	233	211	305	274	244	242	287	333	286	308

Total Employment and Income

	1994	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Total Employment (Average Annual Employment)										
Wood Products	3,471	463	3,866	2,746	1,669	1,612	3,206	4,909	3,197	3,998
Recreation/Tourism	3,664	4,654	4,628	4,628	4,641	4,641	4,628	4,575	4,628	4,588
Non-Res Rec/Tour /2	1,610	2,042	2,031	2,034	2,037	2,037	2,032	2,008	2,030	2,014
Salmon Harvesting /1	2,697	2,697	2,697	2,697	2,697	2,697	2,697	2,697	2,697	2,697
Mining	284	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409
Total Earnings (Million 1994$)										
Wood Products	130.5	17.4	145.4	103.3	62.7	60.6	120.6	184.6	120.2	150.4
Recreation/Tourism	113.6	144.1	143.3	143.5	143.7	143.7	143.3	141.7	143.2	142.1
Non-Res Rec/Tour	49.9	63.3	62.9	63.1	63.1	63.1	63.0	62.3	62.9	62.4
Salmon Harvesting /1	57.8	57.8	57.8	57.8	57.8	57.8	57.8	57.8	57.8	57.8
Mining	16.9	83.8	83.8	83.8	83.8	83.8	83.8	83.8	83.8	83.8
Total Employment Generated in Southeast Alaska (Average Annual Employment)										
All Categories	8,061	6,612	10,002	8,887	7,811	7,755	9,344	11,024	9,333	10,118
Total Earnings Generated in Southeast Alaska (Million 1994$)										
All Categories	255.1	222.3	349.9	307.9	267.5	265.4	325.1	388.5	324.7	354.4

/1 Salmon harvesting employment and income are shown as constant across all alternatives because there is not expected to be a quantifiable effect on fish habitat capability resulting from activities during the next ten years. There is some risk of habitat declines, however, especially over the long term. For further information, refer to the Salmon Harvesting and Processing discussion later in this section and the Fish part of this Chapter.

/2 Non-resident Recreation/Tourism refers to employment generated by non-resident spending in the recreation/tourism sector.

Total employment and income levels are derived using multipliers cited in previous section. Recreation/Tourism employment generated from resident recreation activity was omitted from the calculation of total employment generated in Southeast Alaska. Totals may not sum due to rounding. See text for explanation of estimates for specific industries.

Table 3-110
Total Employment and Income Levels--NIC I Only (1995-2005 Average)

Direct Employment and Income

	1994	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Direct Employment (Average Annual Employment)										
Wood Products	2,225	297	2,189	1,512	932	901	1,833	2,753	1,842	2,422
Recreation/Tourism	2,771	3,520	3,500	3,500	3,510	3,510	3,500	3,460	3,500	3,470
Salmon Harvesting /1	1,899	1,899	1,899	1,899	1,899	1,899	1,899	1,899	1,899	1,899
Mining	163	810	810	810	810	810	810	810	810	810
Total	7,058	6,521	8,394	7,722	7,147	7,117	8,040	8,919	8,045	8,597
Direct Earnings (Million 1994$)										
Wood Products	97	13	95	66	41	39	80	120	80	105
Recreation/Tourism	86	109	108	109	109	109	108	107	108	107
Salmon Harvesting /1	41	41	41	41	41	41	41	41	41	41
Mining	10	48	48	48	48	48	48	48	48	48
Total	233	211	292	263	238	237	277	316	277	302

Total Employment and Income

	1994	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Total Employment (Average Annual Employment)										
Wood Products	3,471	463	3,415	2,358	1,454	1,406	2,860	4,295	2,873	3,778
Recreation/Tourism	3,664	4,654	4,628	4,628	4,641	4,641	4,628	4,575	4,628	4,588
Non-Res Rec/Tour /2	1,610	2,042	2,031	2,034	2,037	2,037	2,032	2,008	2,030	2,014
Salmon Harvesting /1	2,697	2,697	2,697	2,697	2,697	2,697	2,697	2,697	2,697	2,697
Mining	284	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409
Total Earnings (Million 1994$)										
Wood Products	131	17	128	89	55	53	108	161	108	142
Recreation/Tourism	114	144	143	144	144	144	143	142	143	142
Non-Res Rec/Tour	50	63	63	63	63	63	63	62	63	62
Salmon Harvesting /1	58	58	58	58	58	58	58	58	58	58
Mining	17	84	84	84	84	84	84	84	84	84
Total Employment Generated in Southeast Alaska (Average Annual Employment)										
All Categories	8,061	6,612	9,552	8,499	7,597	7,549	8,998	10,409	9,009	9,898
Total Earnings Generated in Southeast Alaska (Million 1994$)										
All Categories	255	222	333	293	259	258	312	365	313	346

/1 Salmon harvesting employment and income are shown as constant across all alternatives because there is not expected to be a quantifiable effect on fish habitat capability resulting from activities during the next ten years. There is some risk of habitat declines, however, especially over the long term. For further information, refer to the Salmon Harvesting and Processing discussion later in this section and the Fish part of this Chapter.

/2 Non-resident Recreation/Tourism refers to employment generated by non-resident spending in the recreation/tourism sector.

Total employment and income levels are derived using multipliers cited in previous section. Recreation/Tourism employment generated from resident recreation activity was omitted from the calculation of total employment generated in Southeast Alaska. Totals may not sum due to rounding. See text for explanation of estimates for specific industries.

comparison with these alternatives. Instead, Alternative 9, which estimates employment levels in the year 2000 under the assumption of full implementation and funding of the current plan, is perhaps a better reference for comparison. It should be noted, however, the Alternative 9 prescribes a higher timber harvest than the 1994 level, and therefore timber employment is higher in this scenario than the current level, or any level over the last 15 years. Current harvests are significantly lower than those prescribed in Alternative 9 due to the inability to fully implement the current plan because of litigation, budgets, and other complications which slow the timber sale process.

Total (i.e. direct, indirect and induced) employment and income are also shown in Tables 3-109 and 3-110. In general, changes in total estimates across alternatives will closely follow direct employment and income estimates since the multipliers used for each industry were constant for all alternatives. The final two rows in Tables 3-109 and 3-110 present aggregate estimates for total employment and income generated in Southeast Alaska by the included industries for each alternative. To derive these estimates, total employment and income figures for each industry were summed. Rather than use the total recreation and tourism figures, only the portion of recreation and tourism economic activity generated by non-residents was used. As explained in the previous section, the reason for this is that resident recreational activity brings no new money to Southeast Alaska and thus does not generate new employment in the region. Estimates of total employment and income generated in the region show the same pattern across alternatives as do estimates for the total level of direct employment and income. A more detailed description of the alternatives relative to each industry and the methods by which these estimates were derived is included in the industry-specific subsections below.

Timber

The estimation of average timber-related employment and income levels for the next decade involves a three-step process. In the first step, forest inventory data are used to divide the projected timber harvest projected by each alternative into separate species and log grades. In the second step, data related to mill operations are used in combination with the estimates derived in the first step to estimate expected final product outputs (i.e. lumber, pulp and chip exports). The final step uses these outputs to estimate employment levels given historical ratios of jobs to volume of final product output. Each step and its results are described in greater detail below. While the following estimates are expected averages for the next decade, sustained yield requirements for each alternative will result in relatively stable expected harvests throughout the rotation. Log class and species mix may vary to a small extent, but the following estimates are generally applicable to decades following 2005 until harvesting of second growth dominates harvest levels.

Harvest. Average species and log grade distributions for high medium and low levels of stocking in the Chatham, Ketchikan and Stikine areas were used to divide the projected harvest levels into log grades and species types. Lower sawlog grades, especially no. 3 sawlogs, are commonly used for pulp production as well as for lumber, with this ratio being largely dependent upon the relative price of lumber and pulp. In this report, we have used historical averages of the percentage of log volume in each log grade which is shipped to sawmills (as opposed to pulp or chip mills) to estimate the proportion of hemlock and spruce logs used for lumber and for pulp. An additional 121 million board feet (MMbf) of non-Tongass National Forest harvest (100 MMbf from native lands and 21 MMbf from state and other sources) is assumed for each scenario, with 20 MMbf of this volume being used for pulp production and the rest leaving the region as log exports.

Resulting estimates of supply by species and general log class are shown in Figure 3-24 and further detailed in Table 3-111. Approximately 53 percent of the Tongass National Forest harvest is comprised of hemlock and spruce sawlogs used in the production of lumber under each alternative; 39 percent of the harvest is used for pulp wood and 9 percent is comprised of cedar logs which are generally exported in unprocessed form. While there is some variance in these ratios across the different alternatives, differences are small (on the order of one percent). Table 3-111 also includes estimates of log production under the assumption that only acres in the probable sale quantity (NIC I) are cut. The NIC I is a subset of the total ASQ and represents those acres where harvest operations are considered to be currently economically feasible. Acres included in the ASQ but not in the NIC I are more costly to harvest, and it is likely that they will not be cut given current market conditions. On average, NIC I estimated harvests are 15 percent less than total ASQ estimates on volume basis, and this ratio is relatively stable across all alternatives. The distribution of harvest by general log type is approximately the same as that for the total ASQ.

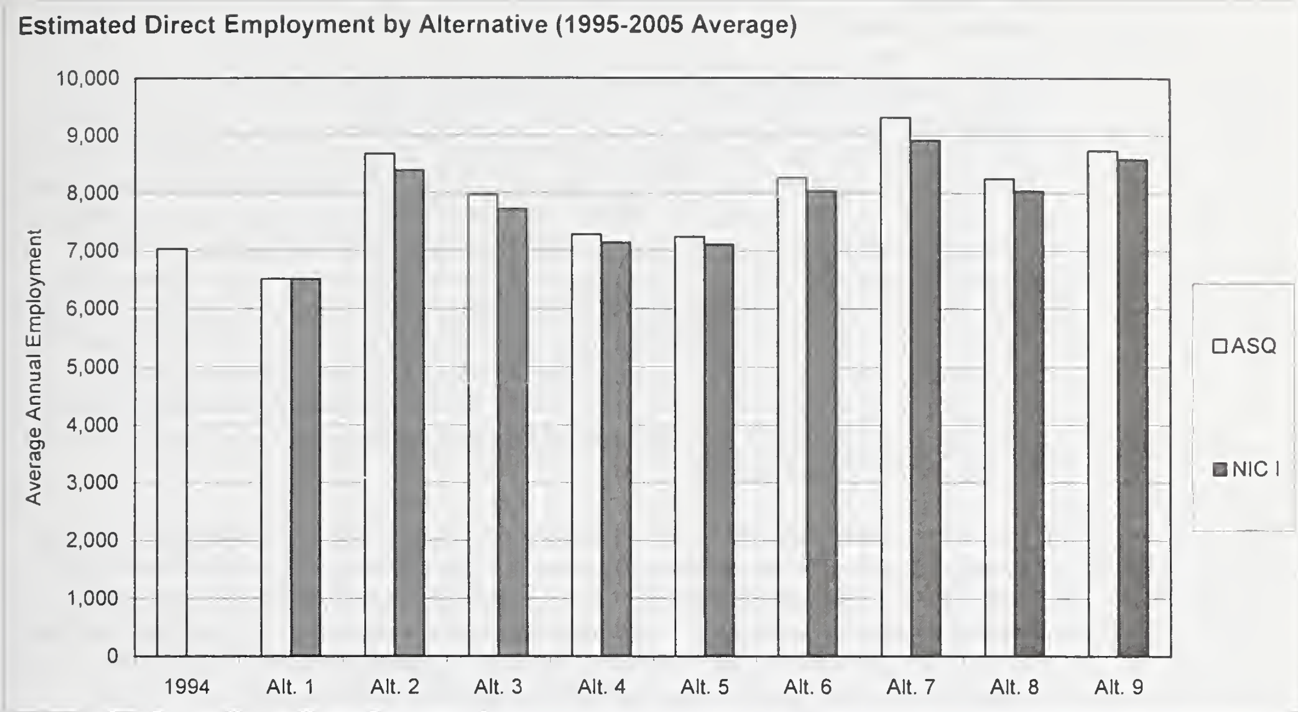
Figure 3-24 and Table 3-111 allow for comparisons of harvest volumes between alternatives and with 1994. Only alternatives 2, 7 and 9 provide higher total harvest levels than that occurring in 1994. Alternative 7, the most timber intensive alternative, provides 58 percent more volume than the 1994 harvest under the total ASQ estimate and 36 percent more volume than 1994 under the assumption that only the NIC I is cut. Alternative 9, which provides an approximation of what current harvests would be given full implementation of the current plan, is the second most timber intensive alternative and supplies 24 percent and 16 percent more volume than 1994 respectively under ASQ and NIC I assumptions. Alternative 1, in which no harvests on the Tongass National Forest take place, is the least timber intensive of the alternatives, with projected harvest volumes (comprised of non-Tongass National Forest harvests exclusively) 76 percent below 1994 levels. The other alternatives are distributed between these two extremes. Because of the assumption of a significant decline in non-Tongass National Forest harvest volumes, changes in total harvest and Tongass National Forest harvest for the alternatives differ. Alternatives 6 and 8, for example, call for a 32 percent increase in Tongass harvests but still entail a five percent decline in total harvest due to the fall in private harvests.

Table 3-111
Estimated Timber Harvest (1995-2005 Average)

	Total ASQ Harvested (MMbf ls)									
	1994	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Non-TNF	235.6	121	121	121	121	121	121	121	121	121
Hem-Spruce Sawlogs	--	0	259	148	77	74	194	362	192	272
Hem-Spruce Pulp Logs	--	0	192	109	57	55	143	268	142	201
Cedar Logs	--	0	36	20	10	9	26	54	28	40
Total TNF	275.8	0	487	277	145	138	363	684	362	513
Total	511.4	121	608	398	266	259	484	805	483	634
	NIC I Only Harvested (MMbf ls)									
	1994	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Non-TNF	235.6	121	121	121	121	121	121	121	121	121
Hem-Spruce Sawlogs	--	0	213	121	63	60	158	299	159	248
Hem-Spruce Pulp Logs	--	0	158	90	47	45	117	222	118	185
Cedar Logs	--	0	34	19	10	9	25	51	26	41
Total TNF	275.8	0	405	230	120	114	300	572	303	474
Total	511.4	121	526	351	241	235	421	693	424	595

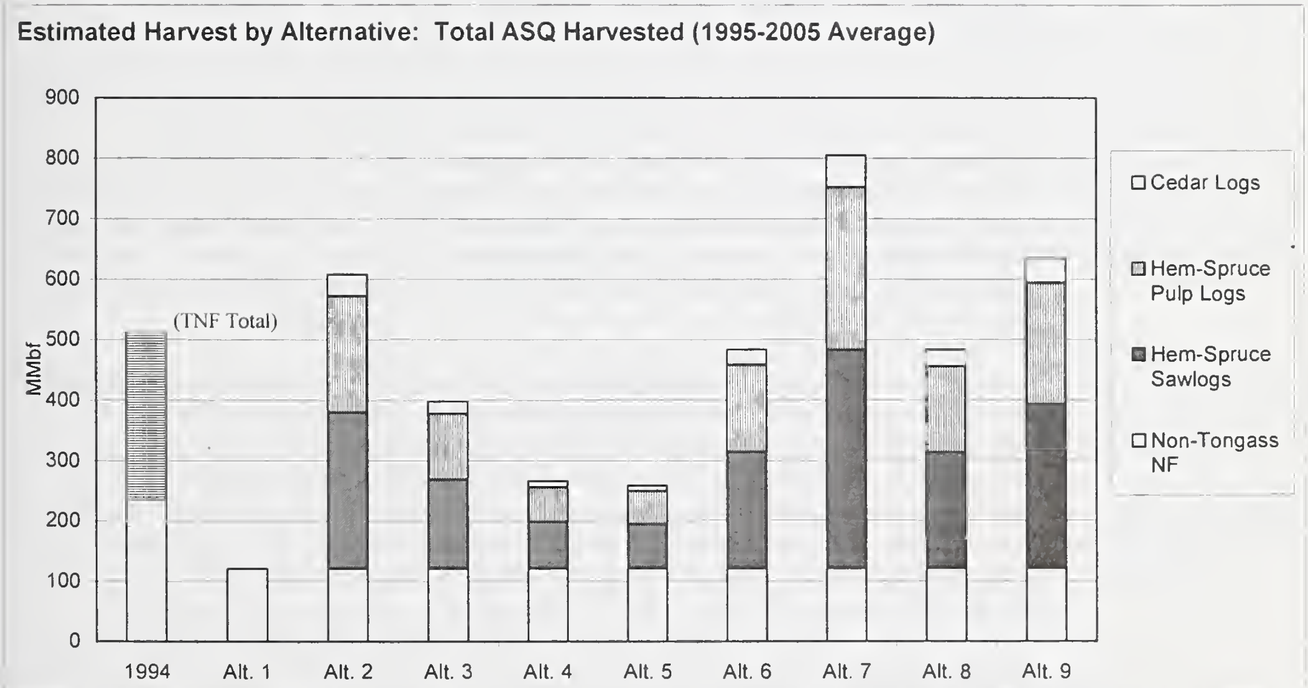
Source: USDA Forest Service. See text for explanations.

Figure 3-23.



Source: USDA Forest Service
Direct employment total for timber, recreation, salmon fishing and mining. See text for explanations.

Figure 3-24.



Source: USDA Forest Service.
See text for explanations.

Product Outputs. Timber product outputs were derived through a materials accounting approach using various conversion factors and estimates of product recovery (Brooks and Haynes, 1994). It is assumed that all logs listed under the "Hem-Spruce Sawlogs" category in Table 3-111 are shipped to local sawmills. A small proportion of these logs (based upon historical evidence) will be chipped directly at the mill with the remainder sawn for lumber. Cedar logs and a majority of non-Tongass National Forest harvests are assumed to be exported as logs. "Hem-Spruce Pulp Logs" along with 20 MMbf of non-Tongass National Forest volumes provide chips for use in pulp manufacture. When combined with estimated residue from sawmilling, these chips constitute the total supply of material for pulp production and chip exports. Using appropriate product conversion factors, production volumes for lumber, pulp, and log exports were estimated. Chip exports were calculated by subtracting estimated total chip inputs needed to meet full capacity production of the Ketchikan Pulp Co. (KPC) pulp mill from the available supply of chips. The product recovery ratios used are estimates based on current production technologies. While increases in conversion efficiencies (i.e. the amount of output which can be produced from a unit of log input) may be substantial in the long run, they should be relatively stable over the next decade and will not produce a major bias in first decade product output estimates.

The results of this stage of the analysis are shown in roundwood equivalents (MMbf log scale) in Table 3-112. All estimates represent 10 year averages centered on the year 2000. The magnitude of impacts for each alternative generally mirrors the impact on harvest levels discussed above. However, due to the assumption of significant declines in private harvest in conjunction with the fact that no private logs are processed for lumber within Southeast Alaska, declines in lumber production relative to 1994 for Alternatives 3, 4, 5, 6 and 8 are less pronounced than declines in total harvest for these alternatives. Private harvests are assumed to have no impact on lumber production and only a minimal impact on the production of pulp. Alternative 8, for example, shows a 5 percent decline in total harvest volume but registers a 31 percent increase in Tongass National Forest harvests. Consequently, lumber production is estimated to also increase by 31 percent in this alternative in spite of a decrease in total harvest volumes. In general, out of six alternatives showing a decline in total harvest, only three show declines in lumber production (Alternatives 1, 4 and 5). The results for pulp production are similar with exception that production is capped at 190 MMbf (roundwood equivalent), and, therefore, the maximum increase relative to 1994 is restricted to 15 percent. Chip exports, shown in the last row in Table 3-112, depict expected surplus in chips. It should be noted, however, that while the KPC pulp mill operated at less than its full 190 MMbf reported capacity in 1994, 26 MMbf of chips were exported in that year indicating that factors other than fiber supply, including the price other purchasers are willing to pay for that fiber, may influence decisions on operating rates.

Employment and Income. Average levels of employment per unit of product output for the 1990-94 period were used to estimate expected levels of direct employment for logging, lumber and pulp production. This time period includes both high levels of production in 1990 (resulting in low levels of employment per unit output) and significantly lower levels in the last two years. Consequently, the averages used here represent a fair estimate of the equilibrium level of employment per product output assuming no change in labor productivity. This assumption is reasonable for the ten year time horizon used in this portion of the analysis. In the long-term, however, increased labor productivity from technology gains could reduce the amount of jobs generated by a given level of output. Jobs per unit of output estimates are shown in the

Table 3-112
Estimated Product Output (1995-2005 Average, MMbf log scale)

	Roundwood Conv.	1994	Alternative 1	2	3	4	5	6	7	8	9
Total ASQ Harvested (MMbf ls)											
Log Production	None	511	121	608	398	266	259	484	805	483	634
Lumber Production	0.79 (Mbf ls/Mbf lt)	121	0	215	122	64	61	160	300	159	225
Pulp Production	0.90 (Mbf ls/Short Ton)	165	20	190	190	111	107	190	190	190	190
Chip Exports (surplus)	0.37 (Mbf ls/BDT)	26	0	135	3	0	0	57	256	56	149
NIC 1 Only Harvested (MMbf ls)											
Log Production	None	511	121	526	351	241	235	421	693	424	595
Lumber Production	0.79 (Mbf ls/Mbf lt)	121	0	176	100	52	50	131	247	131	205
Pulp Production	0.90 (Mbf ls/Short Ton)	165	20	190	163	95	91	190	190	190	190
Chip Exports (surplus)	0.37 (Mbf ls/BDT)	26	0	81	0	0	0	16	183	17	123

Source: USDA Forest Service. See text for explanations.

second column of Table 3-113 on a roundwood equivalent (MMbf log scale) basis. These numbers are then multiplied by the product output estimates presented in the table to derive expected employment levels for each alternative. No estimate for the impact of chip exports on employment was attempted in this analysis. Once again, all estimates represent ten year averages with a midpoint at the year 2000. Total employment and earnings estimates were derived using a multiplier of 1.56 which was derived from the IMPLAN regional economic model. As shown in Table 3-113, six of the alternatives show employment declines relative to 1994 under the assumption that the total ASQ is harvested, and seven alternatives show declines under the assumption that only the NIC I is cut. Only Alternatives 7 and 9 show employment gains under both assumptions. The assumed fall in private harvests to the 121 MMbf level results in the loss of 224 jobs in the logging sector for all alternatives relative to 1994. Consequently, alternatives such as 2 and 9 which entail large increases in Tongass National Forest harvest volumes result in only modest gains in logging employment. For reasons discussed above, sawmill and pulp mill employment will be more directly dependent upon changes in Tongass National Forest harvest levels as opposed to total Southeast Alaska harvests, and only three alternatives show declines in these employment categories relative to 1994 (four alternatives under the assumption that only the NIC I is cut). Direct and total income generated in Southeast Alaska by the wood products industry was estimated using an average earnings estimate of $43,000 per annual average employee and are also shown in Table 3-113.

Capacity. The foregoing analysis assumes a linear relationship between product outputs and employment; a one percent decline in lumber production, for example, will result in a one percent decline in sawmill employment. In the real world this smooth relationship does not exists. Mill closures or openings cause abrupt declines or increases in employment levels which may be extremely destabilizing for the small communities which typify Southeast Alaska. Consequently, in estimating the expected economic impacts of planning alternatives, the relationship between predicted harvest volumes and current lumber and pulp processing capacity cannot be ignored.

To estimate the potential effect on specific mills, and hence their communities, mill capacities will be compared to projected timber supply. Sawmill capacity estimates were given in Table 3-103 of the previous section. The full reported production capacity (two shifts) of Southeast Alaska sawmills is 322 MMbf (log scale) and 1985-94 historic capacity utilization is estimated at 54 percent (approximately one shift), or 173 MMbf. These capacity figures are summarized for each facility and size category in Table 3-114. The 54 percent utilization rate is probably inefficient in the long-run, and additional mill closures could be expected as the more efficient mills move towards full capacity and the less efficient mills are forced to close. At the same time, a 100 percent utilization rate at all mills is unlikely. Consequently, the 322 MMbf and 173 MMbf serve to mark the extreme boundaries of sawlog supply to support the sawmills currently in place in Southeast Alaska.

Figures 3-25 and 3-26 compare the expected timber supply with the capacity requirements of sawmills in Southeast Alaska for each alternative. These figures assume that only that volume which is currently economically viable (NIC I) will be harvested. As no private logs are assumed to be available for sawmilling, Alternative 1 (no Tongass National Forest harvests) is assumed to result in the closure of all sawmills in the region. No alternative is projected to provide enough sawlogs to meet full processing capacity. Three alternatives (2, 7, and 9), however, are sufficient to meet historic utilization levels, and, while Alternatives 6 and 8 are projected to entail further mill closures, Alternatives 2 and 9 are more than sufficient to maintain all currently operating mills. Alternatives 4 and 5 are projected to result in the closure of over half of the region's sawmilling capacity. These expected surpluses and deficits for sawlogs relative to current capacity are further detailed in Table 3-115 along with predictions under the assumption of full ASQ harvest.

Pulp mill capacity and estimates of chip supply (MMbf ls) under the NIC I assumption, are shown in Figure 3-27, and related surplus/deficit estimates are detailed in Table 3-115. Full capacity for the KPC pulp mill is reported at 190 MMbf ls, and historic utilization is reported at 86 percent, or 163 MMbf. In contrast to sawlog supply, five of the alternatives are projected to provide enough raw material to sustain the KPC pulp mill at full capacity (six alternatives under the assumption that the full ASQ is cut). Given either the ASQ or NIC I assumptions, all alternatives except numbers 1, 4 and 5 are projected to be sufficient to keep the mill in operation, and alternatives 2, 7 and 9 are projected to provide significant surpluses for chip export or additional processing capacity within the region. This potential for additional processing in the region could support a Medium Density Fiberboard (MD.) which has been considered for Sitka. The difference between potential sawmill versus pulp mill effects highlights the fact that a large amount of the available timber in Southeast Alaska is of relatively low quality and is most suitable for pulp production or related uses. Alternatives which allow for the efficient utilization of sawmill capacity will result in a significant surplus of chip and pulp log supply relative to currently installed processing capacity. This assumes however that pulp logs and residuals from sawmills are made available to the KPC pulp mill. This may not actually occur. Independent purchasers of timber sales may or may not sell the pulp logs or their residuals to KPC. Should they elect to sell this material to firms outside of Southeast Alaska, the amount of pulp material available to operate the pulp mill in Ketchikan would be reduced. Currently, some of this material is being exported to the Pacific Northwest primarily as chips.

Table 3-113
Timber Industry Employment (1995-2005 Average)

	1990-94 Ave. Jobs/MMbf Is	1994	Alternative 1	2	3	4	5	6	7	8	9
Total ASQ Harvested											
Employment (Average Annual Employment)											
Logging	1.95	1,177	236	1188	777	520	506	945	1572	943	1238
Sawmills	3.33	515	0	714	407	213	204	534	998	529	748
Pulp Mills	3.03	533	61	576	576	337	324	576	576	576	576
Total Direct	--	2,225	297	2,478	1,760	1,070	1,033	2,055	3,147	2,049	2,563
Total	Multiplier = 1.56	3,471	463	3,866	2,746	1,669	1,612	3,206	4,909	3,197	3,998
Income (million 1994 $)											
Direct	@43,453 $/ Job	97	13	108	76	46	45	89	137	89	111
Total	Multiplier = 1.56	151	20	168	119	73	70	139	213	139	174
NIC I Only Harvested											
Employment (Average Annual Employment)											
Logging	1.95	1,177	236	1027	686	471	459	822	1354	828	1162
Sawmills	3.33	515	0	585	333	174	166	435	823	437	684
Pulp Mills	3.03	533	61	576	493	287	276	576	576	576	576
Total Direct	--	2,225	297	2,189	1,512	932	901	1,833	2,753	1,842	2,422
Total	Multiplier = 1.56	3,471	463	3,415	2,358	1,454	1,406	2,860	4,295	2,873	3,778
Income (million 1994 $)											
Direct	@43,453 $/ Job	97	13	95	66	41	39	80	120	80	105
Total	Multiplier = 1.56	151	20	148	102	63	61	124	187	125	164

Source: USDA Forest Service. See text for explanations.

Table 3-114
Pulp and Sawmill Capacity

	Full Capacity	Historic Capacity Used
KPC		
Pulp Mill	150	163
Ketchikan Sawmill	50	27
Annette Island Sawmill	60	32
Large Sawmills		
Viking Lumber/Chip Mill	30	16
Seaborne Lumber Company	35	19
Wrangell Sawmill	110	59
Small Sawmills		
Metlakatla Indian Tribe	10	5
Pacific Rim Cedar	10	5
The Mill, Inc.	5	3
Jim Ensley	5	3
Misc. Other Small Purchasers (1)	7	4
Total:	**512**	**336**

(1) Includes music wood, cedar salvage, and portable mills.

Figure 3-25

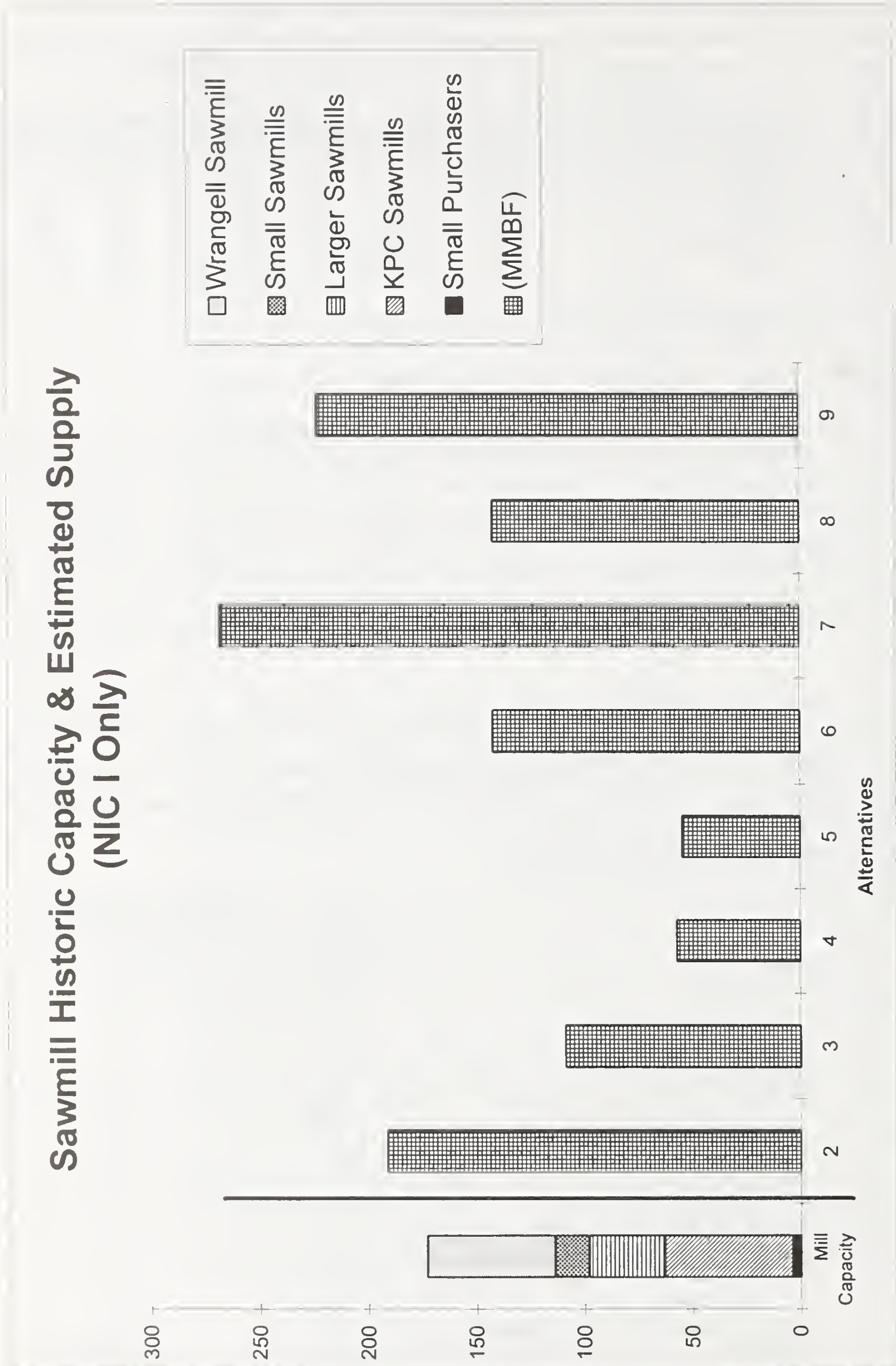

Sawmill Historic Capacity & Estimated Supply
(NIC I Only)
Wrangell Sawmill
Small Sawmills
Larger Sawmills
KPC Sawmills
Small Purchasers
(MMBF)
300
250
200
150
100
50
0
Mill Capacity
2
3
4
5
6
7
8
9
Alternatives

Figure 3-26

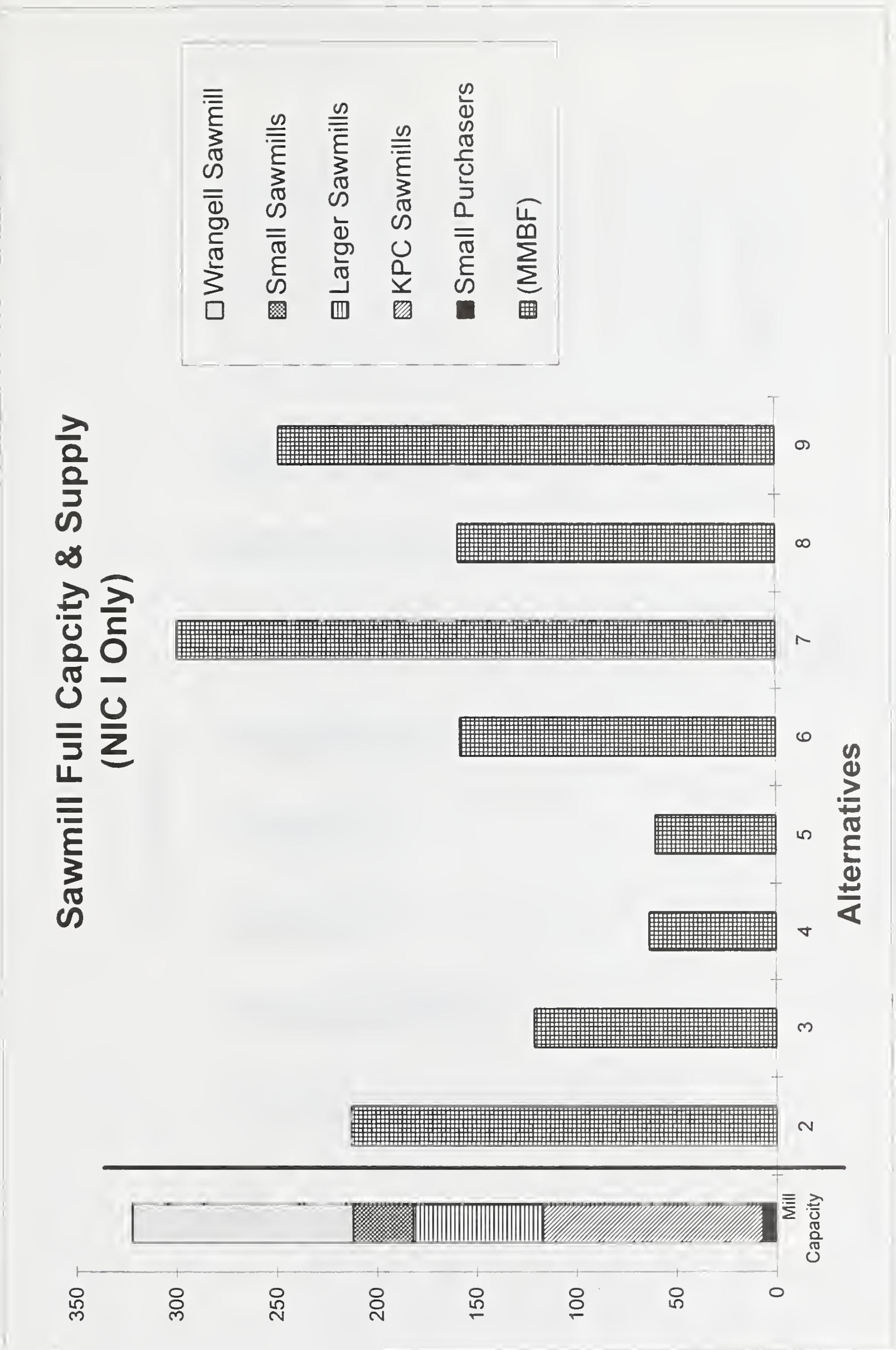
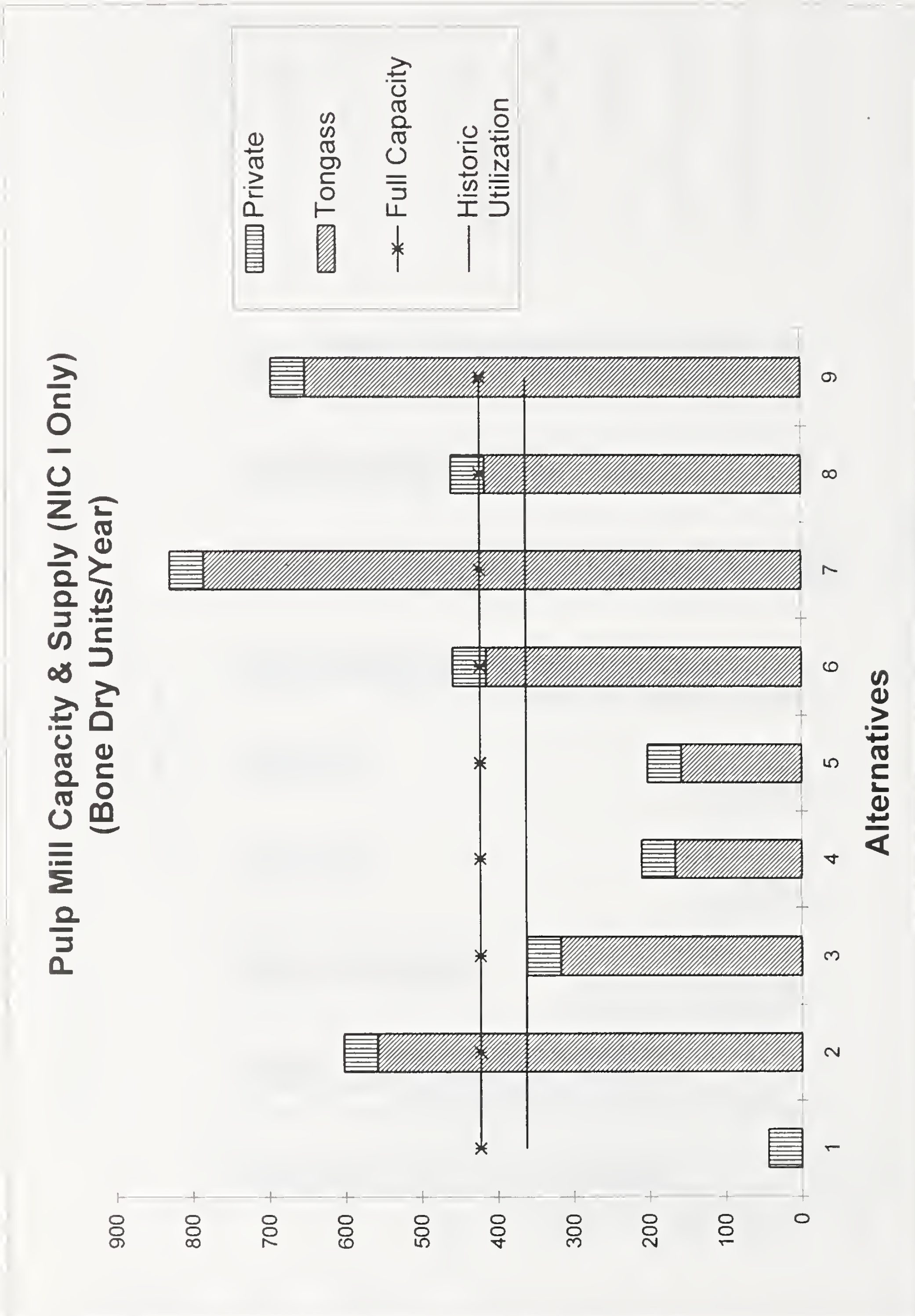

Sawmill Full Capcity & Supply
(NIC I Only)
Wrangell Sawmill
Small Sawmills
Larger Sawmills
KPC Sawmills
Small Purchasers
(MMBF)
350
300
250
200
150
100
50
0
Mill Capacity
2
3
4
5
6
7
8
9
Alternatives

Figure 3-27



Pulp Mill Capacity & Supply (NIC I Only)
(Bone Dry Units/Year)
900
800
700
600
500
400
300
200
100
0
1
2
3
4
5
6
7
8
9
Alternatives
Private
Tongass
Full Capacity
Historic Utilization

Table 3-115
Processing Capacity and Estimated Timber Surplus/Deficit (1995-2005 Average, MMbf)

	Alternative								
	1	2	3	4	5	6	7	8	9
Total ASQ Harvested									
Sawlog Supply and Lumber Production									
@ Historic Utilization (173 MMbf/yr.)	(173)	86	(25)	(96)	(99)	21	189	19	99
@ Full Capacity (322 MMbf/yr.)	(322)	(63)	(174)	(245)	(248)	(128)	40	(130)	(50)
Chip Supply & Pulp Production									
@ Historic Utilization (163 MMbf/yr.)	(143)	162	30	(52)	(56)	84	283	83	176
@ Full Capacity (190 MMbf/yr.)	(170)	135	3	(79)	(83)	57	256	56	149
NIC I Only Harvested									
Sawlog Supply and Lumber Production									
@ Historic Utilization (173 MMbf/yr.)	(173)	40	(52)	(110)	(113)	(15)	126	(14)	75
@ Full Capacity (322 MMbf/yr.)	(322)	(109)	(201)	(259)	(262)	(164)	(23)	(163)	(74)
Chip Supply & Pulp Production									
@ Historic Utilization (163 MMbf/yr.)	(143)	108	(0)	(68)	(72)	43	210	44	150
@ Full Capacity (190 MMbf/yr.)	(170)	81	(27)	(95)	(99)	16	183	17	123

Source: USDA Forest Service. See text for explanations.

Summary by Alternative. The estimated ten year effects of each alternatives on the regions timber processing facilities under the assumption that only the historically more economically viable timber (NIC I) will be harvested can be summarized as the following (this analysis does not include private harvesting, or imports from outside the region):

Alternative 1

- Closure of all large, small and KPC sawmills
- Closure of KPC pulp mill
- Insufficient volume for other small purchasers.

Alternative 2

- All currently operating sawmills open with one shift (historical capacity) and re-open the Wrangell sawmill with one shift (historical capacity).
  OR
  Operate KPC pulp mill at full capacity.
- Enough additional pulp material available for opening an MDF Plant.
- Sufficient volume for other small purchasers

Alternative 3

- Insufficient volume above currently operating facilities to re-open the Wrangell sawmill.
- All currently operating sawmills open with one shift (historical capacity).
  OR
  KPC sawmills operating with two shifts (full capacity) with closure of other large and small sawmills.
  OR
  Some combination of the two
- If all pulp logs and residuals are sold or delivered to KPC, the pulp mill can operate at historic capacity.
  OR
  KPC will need to run higher grade logs through pulp mill to continue operation at historic capacity (63 percent).

- Insufficient additional pulp material available to open an MDF plant.
- Sufficient volume for other small purchasers.

Alternatives 4 and 5

- Insufficient volume above current operating facilities to re-open the Wrangell sawmill.
- Currently operating large and small sawmills open with one shift (historical capacity) and closure of KPC sawmills.

  OR

  KPC sawmills operating with one shift (historical capacity) and closure of other large and small sawmills.

  OR

  Large sawmills operating with two shifts (full capacity) with closure of KPC and small sawmills.
- Closure of the KPC pulp mill.
- Sufficient pulp material available to open an MDF plant only after a closure of the KPC pulp mill.
- Sufficient volume other small purchasers.

Alternatives 6 and 8

- All currently operating sawmills open with one shift (historical capacity) and re-open the Wrangell sawmill with one shift (historical capacity).
- If all pulp logs and residuals are sold or delivered to KPC, the pulp mill can operate at full capacity.

  OR

  KPC will need to run higher grade logs through pulp mill to continue operation .
- Insufficient additional pulp material available for opening an MDF Plant.
- Sufficient volume other small purchaser

Alternatives 7 and 9

- All currently operating sawmills open with two shifts (full capacity) and re-open the Wrangell sawmill with one shift (historical capacity).
- Operate KPC pulp mill at full capacity.
- Enough additional pulp material available for opening an MDF Plant.
- Sufficient volume other small purchasers

Recreation and Tourism

Unlike timber production in which a generally sustained output of products is assumed under each alternative, recreation supply is subject to cumulative impacts. 1995-2005 averages for available recreation opportunity settings (expressed in terms of ROS groups) will not be sustained into the future. Instead, the impact of harvest activity on recreation capacity will accumulate over time with increasing impacts in latter decades. However, the fact that current supply generally exceeds demand results in employment and income estimates across alternatives for the next decade show very little variance relative to timber. Impacts in subsequent decades may be somewhat more pronounced, and these impacts will be treated more explicitly later in the section involving efficiency analysis.

The general methodology for deriving expected levels of recreation and tourism employment is described in detail in the discussion of recreation and tourism in the previous section ("Economic Affected Environment"). Three types of recreation opportunity settings (ROS1, ROS2 and ROS3) used in the economic analysis. Timber harvest and other activities result in a reclassification of certain acres from one ROS group to another. Road construction, for example, will generally cause a given area to be reclassified as ROS3 ("Roaded Natural, Roaded Modified and Rural"). The availability for use of ROS3 designations will also depend upon the connection between proposed road networks and ferry landings or local communities. Where no connections exists, ROS3 recreation places will not receive any motorized use. Had these acres been classified as ROS1 (or ROS2) previously, the result would be a net reduction of ROS1 and an increase in ROS3 . Depending upon the relative demand for different ROS groups, the result could be either an increase, a decrease or no change in recreation and tourism activity. If, in the current example, demand for ROS1 exceeds supply and ROS3 settings are in surplus, then the net result will be a decrease in recreational activity. If, however, demand exceeds supply for both ROS classes, the net impact on recreation and tourism activity will be zero. Each ROS group has a maximum capacity based on the type of experience expected within the setting. ROS1 has the lowest capacity per acre for primitive activities in which users will not be within sight or sound of other users. ROS2 has a larger capacity per acre than ROS1, but users in this setting expect to see only a few other parties during their trip. ROS3 has the highest capacity and offers opportunities for users to interact frequently with others. While timber harvest activity may actually result in greater total capacity, recorded as RVD's, it is an increase of ROS3 capacity and a decrease in ROS1 or ROS2 capacity.

As described in the previous section, future demand for recreational activity on the Tongass National Forest was predicted using a linear projection of total recreation visitor days (RVDs). Historical patterns of RVD use by ROS class was then used to predict future recreation and tourism demand by ROS class. Using this methodology, demand for ROS2 class RVDs ("Semi-Primitive Motorized") is projected to exceed supply of ROS2 settings in 1996. In all planning alternatives demand for ROS1 RVDs surpasses supply in 2020-30. Demand for ROS3 exceeds supply in 2050-60 or 2060-70 depending upon the timber harvest intensity of alternatives (high rates of harvest entail expanded road construction and thereby more ROS3 settings). Since ROS2 activity is the only activity affected in the first decade, and since impacts related to harvest activity will have had little time to accumulate, differences in expected levels of first decade recreational activity between the alternatives are relatively small. Moreover, due to the large amount of Wilderness, LUD II and other designated areas, the overall sensitivity of recreation and tourism activity estimates to the planning alternatives is small.

Due to expected increases in demand, recreation use increases steadily in all alternatives until the year 2060, when demand in all ROS classes meets or exceeds available supply. In the following decades RVD levels, being wholly determined by supply, stabilize around the five million RVD level. Predicted supply, demand and RVD use by alternative for the next decade is presented in Table 3-116. These estimates include a category termed "Non-capacity Use" which represents Southeast Alaska recreational activity which is not directly dependent upon the Tongass (e.g. tour boating or ocean fishing for species other than salmon). In general, average 1995-2005 expected total RVD activity is 26 percent higher than 1994 levels, and there is little variation in these estimates across different alternatives.

Table 3-117 translates predicted RVD use into expected employment using the 1,352 RVD per job ratio derived from the IMPLAN model and discussed in the previous section ("Economic Affected Environment"). Total recreation and tourism related employment was derived using a 1.32 employment multiplier (also estimated in IMPLAN). In order to determine the net job creation in Southeast Alaska resulting from recreational activity, RVD estimates were further divided into resident and non-resident components using historical ratios of resident and non-resident use. Employment resulting from non-resident use is the source of new job creation in the region. The category, "Total from Non-resident", was obtained by multiplying non-generated employment by the IMPLAN derived employment multiplier. This estimate represents total net job creation in Southeast Alaska due to recreation and tourism activity under each alternative. Income was estimated using the IMPLAN derived estimate of $30,996 per employee. While this estimate may seem high, it is important to remember that much of the income from recreation and tourism employment is concentrated in a short period of time and will thus lead to higher estimates when extended to a whole year on an average annual employment basis. Total income and non-resident generated income were derived in the same fashion as in the case of employment.

While the differences between total employment the various alternatives is small, this analysis obscures several important dimensions of recreation and tourism which may be more strongly impacted by timber harvests. These were discussed in detail under the affected environment. In terms of employment and income, perhaps the most important factor is the impact of timber harvest upon the impressions of out-of-state visitors to Southeast Alaska and the national (and international) public at large. In competing with other recreation and tourism opportunities, the region's main competitive advantage is its image as a vast and essentially pristine wilderness, and extensive timber harvests could threaten this perception. This analysis has not attempted to measure the potential effects of public perceptions on non-resident recreation activity, but this does not imply that they do not exist.

Table 3-116
Recreation/Tourism Supply, Demand and Consumption (1995-2005 Average)

Supply (1,000 RVDs)

		Alternative								
	1994	1	2	3	4	5	6	7	8	9
ROS1	1,443	1,432	1,405	1,415	1,419	1,420	1,408	1,386	1,407	1,394
ROS2	1,668	1,666	1,639	1,647	1,652	1,653	1,641	1,587	1,637	1,599
ROS3	1,851	1,850	1,902	1,883	1,876	1,871	1,892	1,946	1,900	1,924
Total	4,962	4,948	4,945	4,945	4,947	4,945	4,941	4,918	4,944	4,917

Demand (1,000 RVDs)

	1994	2000
ROS1	455	706
ROS2	1,364	2,117
ROS3	346	538
ROS Total	2,165	3,361
Non-capacity Use /1	1,582	1,844
Total	3,747	5,205

Projected Consumption (1,000 RVDs) in year 2000

		Alternative								
	1994	1	2	3	4	5	6	7	8	9
ROS1	455	706	706	706	706	706	706	706	706	706
ROS2	1,364	1,666	1,639	1,647	1,652	1,653	1,641	1,587	1,637	1,599
ROS3	346	538	538	538	538	538	538	538	538	538
ROS Total	2,165	2,909	2,882	2,891	2,896	2,897	2,884	2,830	2,881	2,843
Non-capacity Use	1,582	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844
Total	3,747	4,753	4,726	4,734	4,739	4,741	4,728	4,674	4,725	4,687

Source: USDA Forest Service. See text for explanations.
(1) Non-capacity use includes activities that do not take place physically on the forest, (viewing scenery from cruiseships).

Table 3-117
Recreation/Tourism Related Employment (1995-2005 Average)

		Alternative								
	1994	1	2	3	4	5	6	7	8	9
Employment @ 1,352 RVDs/Job (Average Annual Employment)										
Direct Employment	2,771	3,520	3,500	3,500	3,510	3,510	3,500	3,460	3,500	3,470
Total Employment	3,664	4,654	4,628	4,628	4,641	4,641	4,628	4,575	4,628	4,588
From Non-Resident	1,218	1,545	1,536	1,539	1,540	1,541	1,537	1,519	1,535	1,523
Total From Non-Resident	1,610	2,042	2,031	2,034	2,037	2,037	2,032	2,008	2,030	2,014
Income @ 30,996 $ / Job (Million 1994 $)										
Direct Income	85.9	109.0	108.3	108.5	108.7	108.7	108.4	107.2	108.3	107.4
Total Income	113.6	144.1	143.3	143.5	143.7	143.7	143.3	141.7	143.2	142.1
From Non-Resident	37.7	47.9	47.6	47.7	47.7	47.8	47.6	47.1	47.6	47.2
Total From Non-Resident	49.9	63.3	62.9	63.1	63.1	63.1	63.0	62.3	62.9	62.4

Source: USDA Forest Service. See text for explanations.

Salmon Harvesting and Processing

While it is recognized that there is some risk of fish habitat reduction over the next ten years, (see Fish section), there is not expected to be any significant change to commercial fisheries employment resulting from National Forest activities. This is due to the following reasons:

1. There is a time lag between changes in habitat and changes in salmon returns. Typically, reductions in habitat would not be noticed in return levels until three to five years later.
2. Recent fish returns have been at record highs, therefore, under normal ocean conditions, anticipated runs three to five years from now should also be high.
3. The short-term risk to fish habitat is felt to be from large storm events disrupting habitat (see Fish section). Over the next ten years such storm events are likely to be localized and should not affect region-wide commercial fish harvest.
4. A large segment of the commercial fishing industry operates under a limited entry harvest system. New permit holders are not quickly added to the market during high fish harvest years, nor are they removed during periods of low harvest. The result in either case is the same number of commercial fishers catching either more or less fish.
5. Under any of the alternatives, the amount of acreage of timber harvest is at the most less than 20,000 acres per year during the next ten years. This represents a total of approximately 0.5 percent of the total remaining productive old growth (or 5 percent over the next decade), and less than .02 percent of the entire Forest. This level of additional harvest, given some level of riparian protection and Best Management Practices applied throughout the Forest, should not have a significant effect on commercial fisheries employment over the next ten years. However, due to past management actions and risks associated with future harvests, it is possible localized impacts could be experienced.

Since we have assumed no significant impact over the next decade, we have used 1994 employment estimates as our predicted average level of employment for the year 2000. The long-term impact of timber related activity on salmon populations could be more severe, but quantified estimates of these impacts on salmon harvest are impossible given current scientific knowledge. The 1991 SDEIS used a fish stream productivity model to estimate future impacts on anadromous fish populations. Due to problems associated with the unknown validity of the model, it was not used in this round of the planning process.

Mining

Since the planning alternatives place no additional withdrawals from mineral entry, no impact on mining employment and income across alternatives is assumed. Rock quarries and related operations will be positively correlated with road construction and, thereby, with timber harvest. Employment and income levels related to this activity, however, are included in the multiplier effect associated with timber employment, and are not treated as mining related employment in this analysis. For the next ten years (1995-2005) average mining employment is projected to have assumed an additional 647 jobs due to the opening of the Kensington mine and the reopening of the Greens Creek mine. These developments will not be precluded under any of the alternatives. It should be noted however that the economic viability of these and other potential mine developments could be affected by the amount of mitigation measures required in the different Land Use Designations. While all LUD's have mitigation measures to maintain soil, water and fish productivity, some LUD's have additional restrictions for discretionary mitigation such as visual quality which could affect the economics of some of the developments.

Distribution of Social/Economic Effects

In addition to the effects displayed by the regional employment and income totals shown previously in this section, the distribution of where these effects occur is important to the residents of Southeast Alaska. This is true for residents who support timber harvest, as well as those who are opposed. As described elsewhere in the Revised Supplement, timber harvest and road construction are the primary activities permitted by the Forest Plan which can influence employment, income, recreation and tourism, fisheries, hunting, and subsistence. While the maps of the alternatives accompanying the Revised Supplement display those Land Use Designations (LUD's) which permit timber harvest, they do not illustrate where timber harvest could be scheduled over the next 10 to 15 years, the life of the plan. There are standards and guidelines contained within the alternatives which preclude intensive timber harvest over the next 10 years in LUD's which otherwise would have allowed timber harvest. These standard and guidelines do not show up on the alternative maps, but affect where timber harvest can occur. These standards and guidelines include:

1. Maintaining 33% of each VCU as old growth (Alternatives 4, 5 and 6)
2. Not allowing harvest in VCU's where past harvest exceeds 25% of the 1954 old growth (Alternatives 4 and 5)
3. Not allowing harvest in VCU's where past harvest exceeds 50% of the 1954 old growth (Alternative 6)
4. Establishing small Old Growth Reserves containing 1,600 acres of old growth in each watershed (Alternatives 3, 5, 6 and 8)
5. Precluding timber harvest in Wildlife Analysis Areas where the ratio of deer harvest compared to estimated habitat is too high.

The net effect of these standards and guidelines is that intensive timber is precluded for the next ten years in areas where the LUD on the alternative map would otherwise permit it. To assess these effects and to illustrate where intensive timber harvest will be permitted during the life of the plan, maps of each alternative display the locations where harvest will be permitted are included here. (These are Figures 3-28 through 3-34. Alternative 1 has no scheduled timber harvest and is not included.) The darker areas on the maps show lands available for harvest in the normal operability class. The lighter shaded areas represent areas available for harvest in the difficult and isolated operability class. The majority of the normal operability acres are currently economically viable for harvest, while only a small portion of the difficult and isolated areas are currently economically viable. The difficult and isolated operability areas could become economically viable if timber prices increase. It must be emphasized that only a small portion of these areas would actually be scheduled for timber harvest over the next decade. It should also be noted that timber harvesting in other portions of the LUD's which permit harvest, but are not shown on this map, may also be permitted. However harvest in these areas will consist only of non-intensive selective harvest, and does not exceed 2 MMbf in any alternative.

The distribution of the timber harvest will have impacts on several communities. For example, Alternatives 4, 5 and 6 preclude virtually all timber harvest on North Prince of Wales, and Northeast Chichagof Islands. Communities whose primary employment comes from timber harvesting and road construction in these areas would be adversely affected. Residents of these communities such as Thorne Bay, Whale Pass, Coffman Cove, Naukati, and Hoonah who are employed in the timber industry would either have to relocate, commute longer distances, or live in logging camps during the work week. Similarly, communities which are generally opposed to additional timber harvest in these some areas will benefit from these standards and guidelines. This includes communities such as Point Baker, Port Protection, and Tenakee Springs.

Figure 3-28
Distribution of Areas Available for Harvest During the Next Ten Years (Alternative 2)

Figure 3-29
Distribution of Areas Available for Harvest During the Next Ten Years (Alternative 3)

Figure 3-30
Distribution of Areas Available for Harvest During the Next Ten Years (Alternative 4)

Figure 3-31
Distribution of Areas Available for Harvest During the Next Ten Years (Alternatives 5 & 6)

Figure 3-32
Distribution of Areas Available for Harvest During the Next Ten Years (Alternative 7)

Figure 3-33
Distribution of Areas Available for Harvest During the Next Ten Years (Alternative 8)

Figure 3-34
Distribution of Areas Available for Harvest During the Next Ten Years (Alternative 9)

Forest Receipts and Payments

The Forest Service is required by law to return 25 percent of Tongass National Forest gross receipts, including purchaser road credits (PRCs), to the boroughs and census areas of Southeast Alaska. These funds are used to augment road and school budgets. While in the past Tongass National Forest money has not constituted a major proportion of these budgets, the potential effects of planning alternatives in this area is of concern to local communities.

Table 3-118 shows expected forest receipts by general category for each alternative along with 1994 levels. Alternatives assume full implementation of both timber harvest and capital improvements. “Timber Receipts” refer to expected revenues from the sale of timber minus assorted harvest and road construction costs and are analogous to the income the Forest can expect from the sale of timber. “Other Receipts” include a number of different categories with various recreation and tourism user fees accounting for approximately 84 percent of this category. “Road Credits” have historically comprised the bulk of budget items falling under the general category termed “capital improvements” in this report. Other items in this general category include KV and salvage funds. While figures for these were available for 1994, they were not estimated for the planning alternatives. “Total Receipts” are the sum of cash receipts and capital improvements and are used the base from which payments to the state of Alaska are estimated.

Most alternatives show a large increase in the projected returns to the State. A major factor behind the sharp increase in timber revenues for most alternatives relative to 1994 is the projected 2 percent annual real (i.e. after inflation) increase in timber (stumpage) prices for sawlogs. Alternative 9 shows a much larger return to the state than the actual 1994 returns. This is due to the assumption of full implementation of Alternative 9, whereas activity in 1994 was subject to factors such as litigation and budgets. Given expected long-term trends involving expanded consumption throughout the Pacific Region and continued supply constraints on quality softwood sawlogs, this assumption seems reasonable (Brooks and Haynes, 1994). In contrast, stumpage prices for utility grade timber (used primarily as pulpwood) were projected to remain stable.

All of the alternatives except 1, 4 and 5 show substantial increases in payments to Alaska relative to 1994. More timber intensive alternatives generate higher timber revenues and also entail greater road construction and thereby higher PRC levels. Alternative 7, for example, is estimated to generate 4.7 times more total revenue than was obtained in 1994, and Alternatives 4 and 5 produce approximately the same amount of revenue for the state as in 1994 in spite of reduced harvest levels for each of these alternatives. Due to the assumption of increasing sawlog prices, all alternatives show increasing revenues for the next few decades. However, as available old-growth inventory is exhausted and harvests of second-growth stands begin to comprise an increasing component of total sales and gross revenues may decline due the different mix of log grades.

Table 3-118
Tongass National Forest Receipts and Payments to Alaska (1995-2005 Average)

		Alternative								
	1994	1	2	3	4	5	6	7	8	9
Cash Receipts (1,000 1994$)										
Timber Receipts	5,247	0	49,640	24,142	13,011	12,103	30,235	70,892	32,429	61,243
Other Receipts	906	220	384	384	386	386	384	377	384	379
Total Cash Receipts	6,153	220	50,024	24,526	13,397	12,489	30,620	71,269	32,813	61,621
Capital Improvements (1,000 1994$)										
Road Credits (PRC)	22,914	0	63,754	36,538	19,147	18,275	48,371	91,126	48,053	80,037
Other	5,838	0	220	124	65	62	161	304	161	272
Total Cap. Imp.	28,751	0	63,973	36,661	19,212	18,337	48,532	91,430	48,214	80,309
Total and Payments to State of Alaska (1,000 1994$)										
Total Receipts	34,905	220	113,997	61,187	32,609	30,826	79,152	162,700	81,027	141,930
Payments to AK	8,726	55	28,499	15,297	8,152	7,706	19,788	40,675	20,257	35,483

Source: USDA Forest Service. See text for explanations.

Economic Efficiency Analysis

Efficiency analysis seeks to measure all of the costs and benefits associated with a given planning alternative and summarize them in the form of a "present net value" (PNV). In deriving PNV figures, costs are subtracted from benefits to yield a net value. "Future values" (i.e. benefits received in the future) are discounted using an appropriate discount rate to obtain a "present value." The PNV of a given alternative is the discounted sum of all benefits minus the sum of all costs associated with that alternative. Following Forest Service standard procedures, a four percent discount rate is used. While the question of which discount rate to use is hotly debated, the four percent level is congruent with that commonly used throughout public policy.

A major component of PNV is comprised of what economists term producer and consumer surplus. Producer surplus refers to the amount of money a company receives from sales over and above its costs of production and is analogous to the concept of profits. Consumer surplus, on the other hand, refers to the amount of benefit a person receives from a good minus the cost of purchasing it. This benefit is commonly conceived of as the maximum amount a person would be willing to pay for the good minus its actual price and is referred to as net willingness to pay (WTP). Where goods are traded in the market place, such as in the case of timber, consumer and producer surplus can be calculated after estimating the demand and supply schedules for the given market good. For goods which are not traded, such as forest recreation and tourism or environmental preservation, more elaborate (and often more tenuous) techniques must be used. Since PNV estimates attempt to condense a large amount of information into a single value, they must be used with caution. A complete accounting of all the costs and benefits (both traded and non-market) is a practical impossibility, and one must be aware of what is and is not included in the PNV estimate.

In the following analysis we have provided estimates for the timber program and recreation and tourism. For reasons discussed below, commercial fishing and mining were excluded from the PNV calculation. Also, non-use values were not included. These are mainly comprised of existence and option values. Existence values refer to the amount an individual would be willing to pay to preserve old growth forest stand, for example, even if she had no intention of ever visiting it. Option values refer to the amount a person would be willing to pay to maintain the option of visiting the stand even if she had no immediate intention of doing so. While the non-use values associated with the Tongass National Forest as a whole are no doubt considerable, they are extremely difficult to accurately measure, particularly on the per acre basis which would be needed in order to make a comparison between alternatives. PNV estimates for timber and recreation and tourism are presented in Table 3-119, and the derivation of these estimates is detailed below.

Table 3-119
Present Net Value for Recreation/Tourism and Timber

	Alternative								
	1	2	3	4	5	6	7	8	9
Net Present Value (discounted @ 4 % per annum)									
Timber	0	797	404	361	331	494	1,191	543	1,007
Recreation/Tourism	4,606	4,503	4,521	4,511	4,522	4,502	4,338	4,500	4,381
Total	4,606	5,300	4,924	4,872	4,853	4,996	5,529	5,043	5,387

Source: USDA Forest Service. See text for explanations.

Timber

Southeast Alaska's timber industry is commonly seen as a price-taker with no significant ability to impact prices for timber in national and international markets. Volumes produced by the region are comparatively small and, unlike the Pacific Northwest, a large reduction in Southeast Alaska harvests would not be expected to have a significant impact on lumber prices in the consuming regions. It is likely that the region has some market power in the supply of Sitka spruce, as no immediate substitutes are readily available. However, there is no estimated demand curve for this product, and the consumer surplus would accrue most to consumers outside of the United States (primarily Japan). As a result there is no consumer surplus associated with Tongass National Forest timber. As for producer surplus, it is commonly assumed in competitive market transactions that buyers will bid up the price of an intermediate to the point where no company profits are possible. With the exception of long-term contract offerings, Tongass National Forest sales are based on a competitive bid system. However, the long-term contract was modified by the Tongass Timber reform act to assure that long term sale offerings timber prices shall be adjusted to be comparable to independent sale prices. Consequently it is reasonable to assume that no company profit is associated with the Tongass National Forest timber sale program. While at first this claim may seem extreme, it must be remembered that the no-profit assumption applies to the "average firm;" more efficient firms will tend to make profits while less efficient firms will tend to operate at a loss. Likewise, the term "profit" is meant in the economic sense and excludes expected returns to capital at competitive market interest rates.

Given the above assumptions, whatever surplus is associated with Tongass National Forest timber sales is restricted to the net revenues received by the National Forest. Tongass National Forest net revenues are roughly equivalent to the timber cash receipts discussed in the previous section on forest receipts and payments to Alaska except that in this case Forest Service administration and sale preparation costs are subtracted as an additional expense. These net revenues were derived for each decade in the 160 year planning horizon using the FORPLAN harvest scheduling model. Future revenues were discounted at four percent using 1996 as a base year and assuming full implementation of the given alternative beginning in 1997. All estimates are based on the assumption that the total ASQ is harvested. The results are shown in the first row of Table 3-119. In general, alternatives with higher ASQ levels show higher PNV estimates. While these timber intensive alternatives project lower, or even negative, net revenues in latter decades (after 2050) due to the influx of lower grade second growth logs, the effect of the four percent discount rate serves to emphasize the near term over the long-term. Since the sale of timber constitutes the sole source of revenue used in this stage of the analysis, Alternative 1, in which virtually no timber is harvested, shows a zero PNV. Alternative 7, on the other hand, shows a $1.2 billion PNV, and the other alternatives are distributed between these two extremes.

Recreation and Tourism

Unlike timber, recreation and tourism is not directly traded in the market place, and the techniques used to calculate PNV for recreational activity are considerably different than those used for timber revenues. Recreational users of the Tongass National Forest generally pay for only a small proportion of the total benefits they receive from the forest. The net benefits they receive are not recorded in any market transaction and must therefore be estimated. The measure used in this analysis is average net willingness to pay which is derived from 1988 survey data. For general recreational activity, this figure is estimated at $25.73 (1994 $) per RVD, and for sport fishing the estimate is approximately $800 per RVD). Using the proportion of 1994 total RVDs comprised by sport fishing, a weighted average of $52.46 per RVD was derived. This figure represents the average amount a Tongass National Forest recreational user would be willing to pay for a day's recreation over and above expenses already incurred.

Future recreation and tourism use on the Tongass was estimated using techniques already described in the "Economic Affected Environment" portion of this document and further detailed in the impact analysis of recreation and tourism activity presented above. Expected net future value was derived by multiplying total RVD use by the average net WTP estimate of $52.46. These values were then discounted to 1996 and summed using 1997 as the initial period. The resulting PNV estimates are shown in the second row of Table 3-119. Recreation and tourism PNV estimates are considerably higher than those for timber, indicating the importance of the Tongass National Forest as a recreational resource for both local residents and outside visitors. For example, timber PNV for Alternative 7 (the alternative with the highest estimate) is only about one fourth of the average recreation and tourism PNV across all alternatives. However, since differences in recreational activity are relatively small between the alternatives, recreational PNV values do not show much variance in spite of their high absolute magnitudes. The differences that do exist are negatively correlated with the timber intensity of the alternative, with the highest levels occurring in Alternative 1 and the lowest in Alternative 7. This is primarily due to the negative impact of timber activity on the availability of ROS2 class ("Semi-Primitive Motorized") settings.

Various aspects of recreation and tourism-related value were impossible to measure or estimate for this report. All RVDs have been treated as equivalent, but it is likely that net WTP varies for different ROS classes. Likewise, the net WTP Figure for a given recreational experience will vary according to a host of factors which may be impacted differently under the different alternatives. By using a constant dollar per RVD estimate, this takes only quantity into account and ignores quality. This quality can take many forms, but must include aesthetic considerations, personal attachments (in the case of local residents who habitually frequent the same "favorite places"), availability of fish and game, and ease of access. Moreover, these quality considerations will extend beyond recreational use directly occurring upon the Tongass National Forest to include cruise ship passengers and others who have come to the region to mainly experience its beauty and wild character.

Salmon Harvesting and Processing

No PNV estimates for the commercial salmon industry were undertaken in this report. There are three main reasons for this omission. First, no quantified variation in estimates of expected catch are available for the planning alternatives (see previous section on salmon harvesting in the impact analysis). The impacts which are thought to occur will mostly be felt in latter decades, and, due to discounting, they would have little effect on PNV estimates. The second reason is that reliable cost data necessary to calculate producer surplus (profits) is unavailable. In any case, it is probable that the zero profit assumption made for timber processors is also operable here. In open-entry fisheries it is reasonable to assume that new entries will continue until average profits approach zero (after wages and the opportunity cost of capital invested in equipment is factored in). With tradable permits, profits may be preserved, but they will be reflected in the permit price and thereby entail an added opportunity cost of additional capital invested in holding the permit. In either case the zero profit assumption would hold, and the producer surplus associated with the fishery would be zero. The third reason lies in the difficulty of calculating the consumer surplus associated with Southeast Alaska's salmon fishery. While the fishery is large enough to impact international prices, no estimate of these impacts were available.

Mining

Estimates of mining PNV also were omitted from this analysis. Since mining activity is not expected to vary by alternative, this omission will have no substantive effect on the study results. Moreover, estimates of PNV for mineral deposits are subject to many of the same difficulties attending other goods along with the added problem that estimates will vary widely depending upon current mineral prices. To attempt a PNV estimate for this industry was felt to be inappropriate within the context of this report.

Summary

While PNV values for recreational activity are estimated to be significantly higher than those for timber, they do not vary between the alternatives to the degree which timber does. Thus the high relative variance of timber estimates produces a strong correlation between timber intensity and total PNV (Table 3-119). At 5.5 billion dollars, the PNV for Alternative 7 is the highest of all the alternatives. At 4.6 billion dollars, Alternative 1 is approximately 20 percent below Alternative 7 and is the lowest of all alternatives. These PNV estimates mirror the results regarding employment and income presented in the impact analysis portion of this report. Higher timber harvests lead to higher employment levels and higher PNV estimates. However, high levels of timber activity will generally have the highest negative impacts on the non-use values which could not be quantified and included in this analysis. These will include aesthetic considerations and concerns about preservation of species habitat and natural ecosystems. They will also include the quality of outdoor recreation and tourism experiences, experiences which comprise a important aspect of the lifestyle of many Southeast Alaska residents as well as the major draw for visitors to the region.

Tongass National Forest Budget

Table 3-120 displays the estimated fiscal budget. Only the timber program is expected to change by alternative. The timber expenditures and revenues are correlated to the amount of timber estimated to be harvested. Those alternatives with a lower ASQ, (Alternatives 1, 4 and 5) will have lower expenditures and revenues and those alternatives with a higher ASQ, (Alternatives 2, 7 and 9) will have larger expenditures and revenues. The recreation, wildlife, fisheries, and watershed programs are estimated to be at the same level of expenditures and revenues in all the alternatives.

Table 3-120. Tongass National Forest Expenditures and Receipts by Alternative (1,000 $)

	Alt1	Alt2	Alt3	Alt4	Alt5	Alt6	Alt7	Alt8	Alt9
ASQ	0	487	277	144	138	362	683	362	513
Recreation									
Operations	10,181	10,181	10,181	10,181	10,181	10,181	10,181	10,181	10,181
Maintainence	1,481	1,481	1,481	1,481	1,481	1,481	1,481	1,481	1,481
Investment Opportunities	8,474	8,474	8,474	8,474	8,474	8,474	8,474	8,474	8,474
Expenditures	20,136	20,136	20,136	20,136	20,136	20,136	20,136	20,136	20,136
Revenues	1,515	1,515	1,515	1,515	1,515	1,515	1,515	1,515	1,515
Minerals									
Operations	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147
Maintainence	0	0	0	0	0	0	0	0	0
Investment Opportunities	0	0	0	0	0	0	0	0	0
Expenditures	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147
Revenues	28	28	28	28	28	28	28	28	28
Watershed									
Operations	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417
Maintainence	79	79	79	79	79	79	79	79	79
Investment Opportunities	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440
Expenditures	2,937	2,937	2,937	2,937	2,937	2,937	2,937	2,937	2,937
Revenues	0	0	0	0	0	0	0	0	0
Wildlife									
Operations	9,486	9,486	9,486	9,486	9,486	9,486	9,486	9,486	9,486
Maintainence	1,134	1,134	1,134	1,134	1,134	1,134	1,134	1,134	1,134
Investment Opportunities	6,051	6,051	6,051	6,051	6,051	6,051	6,051	6,051	6,051
Expenditures	16,671	16,671	16,671	16,671	16,671	16,671	16,671	16,671	16,671
Revenues	0	0	0	0	0	0	0	0	0
Fisheries									
Operations	7,402	7,402	7,402	7,402	7,402	7,402	7,402	7,402	7,402
Maintainence	4,039	4,039	4,039	4,039	4,039	4,039	4,039	4,039	4,039
Investment Opportunities	11,539	11,539	11,539	11,539	11,539	11,539	11,539	11,539	11,539
Expenditures	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980
Revenues	253	253	253	253	253	253	253	253	253
Timber									
Operations	110	26,858	15,277	7,942	7,611	19,964	37,667	19,964	28,292
Maintainence	0	0	0	0	0	0	0	0	0
Investment Opportunities	24	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
Expenditures	134	28,058	16,477	9,142	8,811	21,164	38,867	21,164	29,492
Revenues	222	54,057	30,747	15,984	15,318	40,182	75,813	40,182	56,943

Communities

Introduction

The following section contains a brief description of 32 communities in Southeast Alaska, including some of its history, its economic base, and the subsistence resources used by that community. Much of the community information is taken from the Alaska Department of Community and Regional Affairs "Community Profiles" (1995) which used 1990 Census data. All statistics are estimates and are presented to provide a general overview of the communities.

Each community description is followed by an analysis of the potential effects of the alternatives on that community. The analysis includes the results of a Socio-economic Panel which was convened to help us analyze those effects. The table shown under each community's Direct, Indirect, and Cumulative Effects section represents the results of the Panel's analysis. A "subsistence working group" was also convened to help identify potential effects of the alternatives on subsistence. The opinions of the subsistence working group are interwoven into our analysis and also included in the community's Direct, Indirect, and Cumulative Effects section.

Socio-economic Panel

The Socio-economic Panel was comprised of five people working in areas of regional expertise (such as the Alaska Department of Community and Regional Affairs and Alaska Department of Labor) who offered their best professional judgment on 31 Southeast Alaska communities. The panel included:

Peter Freer - *State of Alaska, Department of Community and Regional Affairs*;
Tom Gallagher - *Professor, University of Alaska Southeast, Business School*;
Linda Kruger - *Research Social Scientist, USDA Forest Service, Forestry Sciences Lab, Seattle*;
Anthony Nakazawa - *Associate Professor of Extension Economics, Alaska Cooperative Extension, University of Alaska, Fairbanks;* and
Kristen Tromble - *Labor Economist, State of Alaska, Department of Labor.*

For each community, panelists heard a description of each community from a person very familiar with that community. They then evaluated the community without any discussion among themselves using symbols applied to the following community indicators. The indicators used were determined from issues seen to be important to local residents:

- Resource jobs - timber
- Resource jobs - jobs-tourism/recreation
- Resource jobs - mining
- Economic structure/diversity
- Community stability
- Quality of life
- Recreation opportunities
- Access to traditional lifestyle

The symbols displayed in the tables for each community indicate that at least *two of the five* panelists scored arrows in the same direction.

Symbols used in the community analysis

⇑ (up arrow)	**Expected increase due to the alternative**
⇓ (down arrow)	**Expected decrease due to the alternative**
⇔ (flat arrow)	**No change expected**
? (question)	**Insufficient information to make a decision**

Subsistence Working Group

The subsistence working group included the following regional subsistence experts who offered their best professional judgment:

Cindy Hartmann - *Biologist, National Marine Fisheries Services, Juneau (formerly a subsistence planner with the USDA Forest Service);*

Jack Kruse - *Director, Institute for Social and Economic Research, University of Alaska, Anchorage*;

Hank Newhouse - *Subsistence Coordinator, USDA Forest Service, Ketchikan Area*;

Larry Roberts - *Subsistence Coordinator, USDA Forest Service, Stikine Area*;

Bob Schroeder - *Regional Supervisor, Alaska Department of Fish and Game, Subsistence Division*;

Mike Turek - *Researcher, Alaska Department of Fish and Game, Subsistence Division*;

Ted Schenck - *Subsistence Coordinator and Wildlife Biologist, USDA Forest Service, Chatham Area.*

The Working Group provided a qualitative narrative discussion rather than a fixed-format response as was done by the Socio-economic Panel. Their discussion is woven into the narrative included for each community.

In addition to the largely qualitative discussion included for each community on subsistence, a table for each community is included which shows the estimated deer habitat capability in areas commonly hunted. Deer habitat changes are shown because deer, in most communities, are the principle subsistence species likely to be affected by the alternatives.

Community Assessments

Angoon

Angoon, located on the west coast of Admiralty Island at the mouth of Kootznahoo Inlet, has been there so long that no precise date can be established for its original occupation. The only permanent community on Admiralty Island, Angoon has a population of about 725. It remains a traditional Tlingit Indian village with 82 percent of the population being Alaska Native (Alaska Dept. of Community and Regional Affairs [ADCRA], *Community Information Summaries*, 1995).

Economy

Industry first developed with establishment of a whaling station on nearby Killisnoo Island. The whaling, a BIA school, and the Russian Orthodox Church attracted many Tlingits to Killisnoo. Killisnoo was destroyed by a fire in 1928 causing many Tlingits to return to Angoon.

In 1947, the Angoon Community Association, a newly-formed Indian Reorganization Act council, bought the nearby Hood Bay Canning Company, and many people from Angoon moved to Hood Bay for the summer canning season. The cannery burned down in 1961 and this source of employment was lost.

The major sectors of Angoon's economy today are educational services, fisheries, construction and retail trade. Employment outside these industries is limited to local government and village corporation positions. Employment in all sectors of Angoon's economy is highly seasonal. Unemployment in Angoon is 10.6 percent, compared to 8.2 percent throughout Southeast (*Alaska Economic Trends* 4:1995). The 1990 median household income was $32,083 (ADCRA 1995).

Subsistence Use

In 1987, the per capita household subsistence harvest in Angoon was 242 edible pounds. More than 99 percent of households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho, chinook, and sockeye salmon, halibut, herring roe on kelp, deer, dungeness crab, clams and cockles, chitons, berries, and wood (Tongass Resource Use Cooperative Survey (TRUCS), 1989).

Based on edible pounds harvested, deer at 30 percent and salmon at 29 percent are the most important subsistence resources for Angoon households. Angoon hunters travel an average of 13 miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Angoon households have ever used to hunt deer. Summarizing, the majority of Angoon households hunt deer in Wildlife Analysis Areas (WAA's) 4042, 4054, and 4055. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 4042 (40 deer), 4055 (34 deer) and 4054 (25 deer) (ADF&G 1994). WAA's 4042 and 4054 are not accessible by existing roads while WAA 4055 is two percent roaded.

Opinions

A number of Angoon residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written testimony during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Angoon residents expressed a desire to see more emphasis placed on scenic resources, recreation, fish, wildlife, and subsistence. These same residents also indicated they want the current timber sale program reduced. They do not want additional roads and log transfer facilities, nor do they want to be connected to other roads. They emphasized the importance of subsistence to the community and pointed out the detrimental changes to their traditions since Caucasians came to the area 250 years ago. They are concerned with the high unemployment rate of Angoon, and stress the need for subsistence resources in this regard.

Direct, Indirect, and Cumulative Effects

Angoon is a traditional native community. Commercial fishing and subsistence use are the primary factors influencing Angoon.

Commercial fishing is not expected to be significantly affected by Forest Service activities during the next ten years.

For subsistence use, Admiralty and Catherine Islands are especially important to Angoon. All of the National Forest System lands on Admiralty Island, except Mansfield Peninsula in alternatives 7-8, would be maintained in their current condition in all alternatives.

The Socio-economic Panel's assessment for Angoon used in evaluating the effects described above resulted in the following estimated effects on community indicators:

ANGOON	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇑/⇔	⇔	⇑/⇔	⇔	⇓	⇔	⇓/⇔
Resource jobs - rec/tourism	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/ structure	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Community stability	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇓/⇔
Quality of life	⇑	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓	⇔	⇓/⇔
Recreation opportunities	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓/⇔	⇔	⇓/⇔
Access to traditional lifestyle	⇑	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓	⇓/⇔	⇓/⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 52 percent of the total edible pounds of subsistence resources harvested by Angoon households (Kruse and Frazier 1988).

Table 3-121 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Angoon's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Angoon hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Angoon residents, as well as for all deer hunted within the WAA's. Deer account for 30 percent of the total edible pounds of subsistence resources harvested by Angoon households (Kruse and Frazier 1988).

Subsistence use by Angoon households is unlikely to be directly affected by any of the alternatives as their most heavily used areas will be essentially unmodified under any option. Alternative 1 would provide the least effect on Angoon's subsistence resource, with Alternatives 3, 5, 6, and 8 also having less effect than Alternatives 2, 7, 8 and 9 because of the Old Growth Habitat LUD encompassing Catherine Island. Indirectly, alternatives with greater levels of development (i.e., Alternatives 2, 7, 8, and 9) may create increased competition within Angoon's subsistence use areas if hunters from other communities are displaced due to harvest activity. But with the limited access around Angoon, the impacts would likely be minor.

Table 3-121. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Angoon residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Angoon Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
4042	40	92	2608	2607	2607	2607	2607	2607	2607	2607	2607	2607
4055	34	75	2565	2558	2558	2558	2558	2558	2558	2558	2558	2558
4054	25	47	2222	2222	2222	2222	2222	2222	2222	2222	2222	2222
3308	24	201	3164	2824	2246	2385	2385	2092	2046	1815	2178	1811
3315	21	127	1284	1240	1167	1062	1062	943	924	759	1151	884
	144	542	11843	11451	10800	10834	10834	10422	10357	9961	10716	10082
% Change in Habitat Capability From 1995:				-3.3	-8.8	-8.5	-8.5	-12.0	-12.5	-15.9	-9.5	-14.9
Angoon Harvest As a % of 2095 Capability:				1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.3	1.4
Total Harvest As a % of 2095 Capability:				4.7	5.0	5.0	5.0	5.2	5.2	5.4	5.1	5.4

Coffman Cove

Coffman Cove is located on northeast Prince of Wales Island. The population is 237, with 7 percent Alaska Natives (ADCRA 1995). Settlement of Coffman Cove began in 1956 with development of a logging camp. A road connecting Coffman Cove to the larger community of Craig was built in the 1980s. Two scheduled airlines serve the community from Ketchikan. The Civic Club maintains a harbor, a community building and other public facilities. The post office opened in 1991 (Alaska Dept. of Fish and Game, *Subsistence Resource Use Patterns in Southeast Alaska: Summaries of 30 Communities*, 1994).

Economy

The community is economically dependent on logging, which comprised the largest employment sector during the 1980s and 1990s. Coffman Cove is one of the major log transfer sites on Prince of Wales Island. Other employment includes commercial fishing, education, oyster farming, sport fish chartering, and other private business. The 1994 unemployment rate in this census area was 12.5 percent, compared to 8.2 percent throughout Southeast (*Alaska Economic Trends* 4:1995).

An active city council has pursued plans to develop Coffman Cove as a community with a diverse economic base. The economy of Coffman Cove also included active participation in harvest and consumption of wild resources (ADF&G 1994). The 1989 median household income was $44,063 (ADCRA 1995).

Subsistence Use

In 1987, the per capita household subsistence harvest in Coffman Cove was 186 edible pounds. More than 88 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were chinook salmon, halibut, trout and char, deer, dungeness crab, and berries (TRUCS 1989).

Local hunters report that most Coffman Cove residents hunt in the immediate vicinity of the community and rely heavily on road access. They also say that many non-local hunters use Coffman Cove's local hunting area (Control Lake Draft EIS, p. 3-147).

Appendix C provides detailed maps regarding the areas that Coffman Cove households have ever used to hunt deer. Summarizing, the majority of Coffman Cove households hunt deer in Wildlife Analysis Areas (WAA's) 1420 and 1421. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 1420 (39 deer) and 1421 (39 deer) (ADF&G 1994). These WAA's are 74 and 58 percent accessible by existing roads.

Opinions

A number of Coffman Cove residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written testimony during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Coffman Cove residents who commented on the issues indicated that the forest should be managed both for scenic quality and timber harvesting. Community opinion was split on the topic of recreation with about half wanting more emphasis placed on recreation and half being satisfied with the current management emphasis. Regarding fish, wildlife, and subsistence, Coffman Cove residents who responded indicated that current management emphasis was adequate. These individuals want the current level of timber harvest to continue and favor additional roads, transfer facilities and connecting existing roads. They do not want roads to be closed because they are important to access subsistence resources and recreation areas. Residents are split in their opinion about mineral exploration and development with some wanting more emphasis, others less, and still others wanting a mix of emphases. Those who responded indicated that a combination of timber, mining, and other commodity industries with tourism, recreation and fishing would be the most desirable use of Forest resources.

Direct, Indirect, and Cumulative Effects

Because Coffman Cove is primarily a logging community it will be directly affected by the amount of logging opportunities on northern Prince of Wales Island.

Alternatives 1, 4, 5 and 6 essentially eliminate all intensive timber harvesting on the north end of the island. Although some individual tree selection opportunities would be available, it would amount to less than 2 MMBF in any alternative, and would most likely be purchased by very small operators for products such as music wood or cedar shakes. The result of the lack of logging opportunities would result in disruption of the community stability. Residents who want to stay associated with the logging industry would either have to relocate or travel to remote logging camps elsewhere during the week for employment. If these individuals choose to relocate, the loss of their income would likely affect others in the community.

Alternatives 2, 3, 7, 8, and 9 would continue logging opportunities on the north end of the island. This would allow those individuals associated with the logging industry to maintain their existing lifestyle within the community.

The community could also be affected by the Old Growth Habitat LUD located just south of Ratz Harbor in Alternatives 1, 3, 5, 6 and 8. This LUD could prevent the possible low elevation road connection to Thorne Bay. This road connection would provide the community with access to the ferry terminal during the winter when other roads are closed due to snowfall. This road would likely be completed under Alternatives 2, 4, 7 and 9.

The Socio-economic Panel's assessment for Coffman Cove used in evaluating the effects described above resulted in the following estimated effects on community indicators:

COFFMAN COVE	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇑/⇔	⇓	⇓	⇓	⇓/⇔	⇑	⇑	⇑
Resource jobs - comm. fishing	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓/⇔	⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇑	⇑	⇑	⇑	⇑/⇔	⇓	⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇑/⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇓	⇑	⇑/⇔	⇑	⇑	⇑	⇑/⇓	⇓	⇓/⇔
Community stability	⇓	⇑/⇔	⇑	⇑	⇑/⇓	⇑/⇔	⇓	⇑/⇓	⇑
Quality of life	⇓	⇑/⇔	⇑/⇔	⇑	⇑	⇑/⇔	⇓/⇔	⇔	⇓/⇔
Recreation opportunities	⇑/?	⇑	⇑/⇔	⇑/?	⇑	⇑/⇔	⇑/⇓	⇔	⇓/⇔
Access to traditional lifestyle	⇑	⇔	⇑/⇔	⇑	⇑	⇑/⇔	⇓	⇔	⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 65 percent of the total edible pounds of subsistence resources harvested by Coffman Cove households (Kruse and Frazier 1988).

Table 3-122. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Coffman Cove residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA	Coffman Cove Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1420	39	107	790	790	534	790	790	790	790	516	571	517
1421	39	234	2442	2184	1579	1864	1850	2048	1958	1278	1697	1423
Total	78	341	3232	2974	2113	2654	2640	2838	2748	1794	2268	1940
% Change in Habitat Capability From 1995:				-8.0	-34.6	-17.9	-18.3	-12.2	-15.0	-44.5	-29.8	-40.0
Coffman Cove Harvest As a % of 2095 Capa				2.6	3.7	2.9	3.0	2.7	2.8	4.3	3.4	4.0
Total Harvest As a % of 2095 Capability:				11.5	16.1	12.8	12.9	12.0	12.4	19.0	15.0	17.6

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

Table 3-122 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Coffman Cove's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Coffman Cove hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Coffman Cove residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability and all alternatives may have future inadequate habitat capability for the total deer hunted. At some point, a restriction in hunting may be necessary, especially for Alternatives 7 and 9 which could be close to 20 percent of deer habitat capability being harvested in the year 2095. Deer account for 32 percent of the total edible pounds of subsistence resources harvested by Coffman Cove households (Kruse and Frazier 1988).

WAA 1420 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. Alternatives 1, 3, 4, 5, 6, and 8 are likely to have the least direct effect on Coffman Cove's subsistence resources due to the land allocations of the area surrounding the community. Alternatives 1, 3, 6, and 8 have no harvest or Old Growth Habitat LUD's within much of Coffman Cove's subsistence use areas. Alternatives 4 and 5 have longer rotations to provide a higher level of older forest within their subsistence use areas over time.

Alternatives 3, 6, and 8 may indirectly impact Coffman Cove by displacing hunters from other communities with harvest activities outside of the Old Growth Habitat LUD's. These Old Growth Habitat LUD's may also decrease Coffman Cove's opportunity for additional road access associated with timber harvest activity.

Alternatives 2, 7, and 9 would likely directly impact Coffman Cove's subsistence resources with a continuation, or possible increase in harvest activity. Although deer habitat may be decreased, additional roads would likely increase access to more areas for Coffman Cove hunters. At the same time, these roads may also bring in greater competition from residents of other communities taking advantage of the increased access.

Craig

Craig is situated on a small island connected to the west coast of Prince of Wales Island by a causeway, approximately 56 air miles northwest of Ketchikan. It is connected by road 6 miles from Klawock and 23 miles from Hydaburg. A floatplane dock and heliport are maintained in Craig, and the State ferry serves Hollis 30 miles away enabling transportation of passengers, cargo and vehicles. Craig's population is 1,512, with almost 23 percent Alaska Native (ADCRA 1995).

Tlingit fish camps and seasonal villages originally occupied the present location of Craig (ADF&G 1994). It was named for its contemporary founder, Craig Miller, who in 1907, with the help of local Haidas, established a saltery at Fish Egg Island.

The U.S. Forest established a permanent ranger station there around 1919. The City of Craig was incorporated in 1922 as a second-class city under the laws of the territory of Alaska and became a first-class city in 1973. Shaan-Seet Inc. (the village corporation established under the Alaska Native Claims Settlement Act of 1971) received an interim conveyance of 20,852 acres in 1979 (ADF&G 1994).

Economy

Craig grew in the early 20th century with in-migration of Tlingit and Haida families from small regional villages to participate in expanding commercial fishing. Between the early 1900s and 1973, when a timber mill opened, Craig was dependent on commercial fishing through saltery, canning and fish processing operations. After the mill opened, Craig's population more than doubled to 1,182 by 1988 (ADF&G 1994).

The major sectors of Craig's economy are retail trade, fishing, and timber products. Employment is seasonal in fishing and timber. The 1989 median household income was $47,250 (ADCRA 1995). Unemployment in this census area in 1994 was 12.5 percent, compared to a Southeast rate of 8.2 percent (*Alaska Economic Trends* 4: 1995).

As the most populated town in the Prince of Wales Island Outer Ketchikan Census Area, Craig serves as the primary retail trade center on the Island, and has a high proportion of federal, state, and local government jobs. Although it is the social and economic center of Prince of Wales Island, it appears to have limited attraction for outside recreational tourists making prolonged visits. Craig's economic welfare, therefore, depends primarily on the stability of the direct employment, income, and subsistence that timber harvesting, fishing, and hunting offers (Control Lake DEIS, p. 3-137).

Opinions

A number of Craig residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Craig residents who responded to the issues want to be able to harvest timber along the Alaska Marine Highway routes, roads, and streams and around their community. However, they also requested that additional emphasis be placed on recreation, fish, and old-growth habitat near their community. Opinions were divided on the emphasis to be placed on subsistence; half wanted more, half wanted less. Some respondents requested the current timber sale program be reduced, others stressed the importance of the timber industry to the local economy. They generally favor the current emphasis on mineral exploration and development. Other residents requested that management emphasize tourism, wildlife, recreation, and subsistence sectors of the economy.

Subsistence Use

In 1987, the per capita subsistence harvest in Craig was 185 edible pounds. More than 91 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho salmon, halibut, rockfish, trout and char, deer, dungeness crab, and wood (TRUCS 1989).

Based on edible pounds harvested, invertebrates at 26 percent and deer, salmon, and finfish other than salmon at 22 percent each are the most important subsistence resources for Craig households. Craig hunters travel an average of 25 miles to their most reliable deer hunting areas (Kruse and Frazier 1988). Craig residents report using both boats and road vehicles for access to deer hunting areas. There is some indication that boat-based hunters are willing to hike farther than road-based hunters. Overall, Craig hunters report using road corridors most heavily (Control Lake DEIS, p. 3-149).

Appendix C provides detailed maps regarding the areas that Craig households have ever used to hunt deer. Summarizing, the majority of Craig households hunt deer in Wildlife Analysis Areas (WAA's) 1318, and 1422. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 1318 (117 deer), 1422 (84 deer), and 1319 (43 deer) (ADF&G 1994). These WAA's are 18, 47, and 66 percent accessible by existing roads.

Direct, Indirect, and Cumulative Effects

Craig is primarily a commercial fishing and retail trade community. It is most likely to be affected by changes in commercial fishing, retail services, small timber operators, and overall timber employment.

Retail trade and services have become increasingly important to the economy of Craig. Recreation use is projected to increase roughly to the same degree in all alternatives benefiting retail trade in Craig. However, since Alternatives 1, 4 and 5 essentially halt timber harvest on north Prince of Wales Island, the resulting declines in timber employment could have a ripple effect and reduce retail trade and services employment. This would be especially true during September through May when recreation and tourism use is lower.

Commercial fisheries employment is not likely to be affected by forest management activities to any significant degree during the next ten years.

There are several small timber operators who produce value added products in Craig. These value added products include music wood, cabinets and other products. They need relatively low volumes of timber, but of specific species and grades to meet their needs. All alternatives except Alternative 1 would meet their needs.

Lumber employment is another key element for the community of Craig. The Viking Lumber sawmill is located in nearby Klawock. There would likely not be sufficient volume to keep this mill open in Alternatives 1, 4 or 5. This could result in the loss of jobs in Craig. In addition, Alternatives 1, 4, and 5 essentially eliminate all intensive timber harvesting on the north end of the island. Although some individual tree selection opportunities would be available, it amounts to less than 2 MMBF in any alternative and would most likely be purchased by very small operators for products such as music wood or cedar shakes. Residents in the community who wish to remain associated with the logging industry would either have to relocate or travel to remote logging camps elsewhere during the week for employment.

The Socio-economic Panel's assessment for Craig used in evaluating the effects described above resulted in the following estimated effects on community indicators:

CRAIG	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇓/⇔	⇓	⇓	⇓	⇓	⇑	⇔	⇑/⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇑/⇔	⇑/⇔	⇑	⇑/⇔	⇓	⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇑/⇔	⇑/⇔	⇑	⇑	⇑	⇓	⇓/⇔	⇓
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔
Economic structure/diversity	⇑/⇓	⇑/⇔	⇑/⇔	⇑/⇓	⇑/⇓	⇑	⇓/⇔	⇔	⇑/⇔
Community stability	⇓	⇑/⇔	⇑/⇓	⇑/⇓	⇑/⇓	⇑	⇓/⇔	⇔	⇑/⇓
Quality of life	⇓	⇑/⇔	⇑/⇓	⇑/⇓	⇑/⇓	⇑	⇓	⇔	⇑/⇔
Recreation opportunities	⇑	⇑/⇔	⇑/⇔	⇑	⇑	⇑	⇓	⇔	⇓/⇔
Access to traditional lifestyle	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓	⇔	⇓/⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 70 percent of the total edible pounds of subsistence resources harvest by Craig households (Kruse and Frazier 1988).

Table 3-123 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Craig's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Craig hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Craig residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability and all alternatives may have future inadequate habitat capability for the total deer hunted. At some point, a restriction in hunting may be necessary. Deer account for 22 percent of the total edible pounds of subsistence resources harvested by Craig households (Kruse and Frazier 1988).

WAA's 1318 and 1319 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. With little timber harvest activity, Alternative 1 would have the least effect on Craig's subsistence uses. Alternatives 2 - 9 could have a direct effect on Craig's subsistence resources with much of Craig's subsistence use areas within development LUD's. Application of these LUD's could result in continued and possibly increased harvest activity. Alternatives 3, 6, and 8 would result in some habitat not being available for timber harvest (in the Old Growth Habitat LUD), but these cover a small portion of Craig's use area. Alternatives 4 and 5 incorporate longer rotations which would result in greater quantities of older forest within the development LUD's.

Table 3-123. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Craig residents obtain approximately 75% of their average annual deer harvest.

WAA	Average Deer Harvest From 1987-1994: Craig Residents	Average Deer Harvest From 1987-1994: All Hunters	1995 Deer Habitat Capability	Deer Habitat Capability by Alternative at 2095: Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1318	117	201	1213	1213	1213	1213	1213	1213	782	784	838	764
1422	84	343	3617	2556	2447	2501	2535	2403	2291	1940	2381	2210
1319	43	299	2364	3769	3660	3713.8	3748	3616	3073	2724	3219	2974
1323	43	126	1654	1625	1341	1441	1469.6	1487.6	1396	1239	1408	1220
1529	43	179	2051	1760	1395	1552	1564.4	1601	1495	1270	1494	1311
1421	34	234	2442	2184	1579	1864	1849.8	2048.4	1958	1278	1697	1423
Total	364	1382	13341	13107	11635	12285	12380	12369	10995	9235	11037	9902
% Change in Habitat Capability From 1995:				-1.8	-12.8	-7.9	-7.2	-7.3	-17.6	-30.8	-17.3	-25.8
Craig Harvest As a % of 2095 Capability:				2.8	3.1	3.0	2.9	2.9	3.3	3.9	3.3	3.7
Total Harvest As a % of 2095 Capability:				10.5	11.9	11.2	11.2	11.2	12.6	15.0	12.5	14.0

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

Alternatives 3, 6, and 8 may indirectly impact Craig by displacing hunters from other communities with harvest activities outside of the Old Growth Habitat LUD's. Alternatives 2, 7, and 9 would likely increase access opportunities for Craig hunters to other areas. At the same time, these roads may also bring in greater competition from other communities taking advantage of the increased access.

Edna Bay

Edna Bay is located on southeast Kosciusko Island, west of Prince of Wales Island, and north of Sea Otter Sound. Its population is 80, with no Alaska Native population (ADCRA 1995).

Originally, Tlingit Indians from West Prince of Wales Island used Edna Bay on a seasonal basis. In 1943, a logging camp was established when the demand for aircraft-quality spruce was high. The camp closed in the late 1960s and all the buildings were burned. In 1977, the State selected part of the Tongass National Forest at Edna Bay, with the U.S. Forest Service reserving two administrative sites. In 1982, the State sold several lots around Edna Bay to private landowners. A small community developed as families, mainly those involved in commercial fishing, moved to Edna Bay. A school was constructed and a road connecting dispersed segments of the community was recently completed (ADF&G 1994).

Edna Bay remains an unincorporated city. Edna Bay has a local Fish and Game Advisory Committee. The community has shown a strong commitment to protecting local commercial fishing and subsistence resources (ADF&G 1994). Edna Bay is accessible by water or by float plane from Ketchikan. Most households own skiffs for transportation around the bay and to other nearshore areas not accessible by road (ADF&G 1994).

Economy

Edna Bay has been characterized by a seasonal economy with its peak in the summer/fall fishing season. The majority of the Edna Bay fishers are hand trollers. Besides commercial fishing, other employment is provided by the school, local air carriers, and the local store, which sells groceries and fuel (ADF&G 1994).

Sectors of Edna Bay's economy include fisheries, education services, construction, other small business and repair services. Employment in all these sectors is highly seasonal; 1994 unemployment in this census area was 12.5 percent, compared to a Southeast rate of 8.2 percent (*Alaska Economic Trends* 4:1995). The 1989 median household income was $12,250 (ADCRA 1995).

Opinions

A number of Edna Bay residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Edna Bay residents who responded to the issues requested that additional emphasis be placed on scenic resources, fish, old-growth habitat around their community, and subsistence. Community opinion was split on recreation with half wanting more emphasis and half satisfied with the current recreation emphasis. Similarly, half of the residents were satisfied with the current emphasis on timber harvesting while half wanted less emphasis. Some respondents do not want additional roads, log transfer facilities, or connections to other existing roads, but others would like a road tie to the rest of Prince of Wales Island. Most are opposed to emphasizing access for mineral exploration and development; they want management to emphasize tourism, wildlife, recreation and subsistence economic sectors.

Subsistence Use

In 1987, the per capita subsistence harvest in Edna Bay was 517 edible pounds. All households harvested some subsistence resource. Most commonly used (by over 50% of households) were chinook, coho, and pink salmon, cod, halibut, rockfish, trout and char, deer, abalone, dungeness crab, sea cucumber, scallops, migratory birds, wood, berries, and plants/mushrooms (TRUCS 1989).

Based on edible pounds harvested, finfish other than salmon at 26 percent and deer and salmon at 21 and 20 percent, respectively, are the most important subsistence resources for Edna Bay households. Edna Bay hunters travel an average of eight miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Edna Bay households have ever used to hunt deer. Summarizing, the majority of Edna Bay households hunt deer in Wildlife Analysis Areas (WAA's) 1525 and 1526. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 1525 (32 deer) and 1526 (19 deer) (ADF&G 1994). These WAA's are 81 and 11 percent accessible by existing roads.

Direct, Indirect, and Cumulative Effects

Edna Bay is primarily a commercial fishing and subsistence community. It would not likely be affected differently by any of the alternatives for two reasons. First, commercial fisheries employment is not likely to be affected by forest management activities to any significant degree during the next ten years. Secondly, Kosciusko Island, where the town is located, will not have additional timber harvest activities during the next ten years which could have an impact on subsistence use. The island will not have additional timber harvest activities due to the cumulative effects of past timber harvesting and the presence of legislated LUD II land allocations.

The Socio-economic Panel's assessment for Edna Bay used in evaluating the effects described above resulted in the following estimated effects on community indicators:

EDNA BAY	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓/⇔	⇑/⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔
Resource jobs - comm. fishing	⇑	⇓	⇑/⇔	⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓
Resource jobs - rec/tourism	⇑/⇔	⇓/⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Community stability	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Quality of life	⇑/⇔	⇓/⇔	⇔	⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓
Recreation opportunities	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓
Access to traditional lifestyle	⇑/⇔	⇓/⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 59 percent of the total edible pounds of subsistence resources harvested by Edna Bay households (Kruse and Frazier 1988).

Table 3-124 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Edna Bay's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Edna Bay hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Edna Bay residents, as well as for all deer hunted within the WAA's. Deer account for 21 percent of the total edible pounds of subsistence resources harvested by Edna Bay households (Kruse and Frazier 1988).

Table 3-124. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Edna Bay residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer Habitat Capability	Deer Habitat Capability by Alternative at 2095								
WAA	Edna Bay Residents	All Hunters		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1525	32	40	2003	1694	1608	1521	1608	1550	1328	1207	1551	1207
1526	19	56	2328	2261	2204	2204	2217	2188	2150	2126	2189	2127
	51	96	4331	3955	3812	3725	3825	3738	3478	3333	3740	3334
% Change in Habitat Capability From 1995:				-8.7	-12.0	-14.0	-11.7	-13.7	-19.7	-23.0	-13.6	-23.0
Edna Bay Harvest As a % of 2095 Capability:				1.3	1.3	1.4	1.3	1.4	1.5	1.5	1.4	1.5
Total Harvest As a % of 2095 Capability:				2.4	2.5	2.6	2.5	2.6	2.8	2.9	2.6	2.9

Competition is likely to indirectly affect Edna Bay hunters in alternatives 2- 9 since their subsistence use areas are accessible by boat and within a legislated LUD II that will not be affected by timber harvest. Displaced hunters from other communities may be willing to travel to the Edna Bay area for access to deer hunting.

Elfin Cove

Located on northwest Chichagof Island, Elfin Cove is a small fishing town with 64 residents. (ADCRA 1995).

Prior to its development as a community, Native Tlingit groups, now based largely in Hoonah, had for centuries used the area for hunting, fishing, and gathering, as well as safe harbor.

A fish buyer established a business there in 1927. The opening of a cold storage plant at Pelican, less than 20 miles from Elfin Cove in Lisianski Inlet, meant that fish no longer had to be hauled all the way to Juneau. That plant has, however, announced it would not be in operation in 1996 (*The Paper*, v. 1, no. 15, Feb. 28, 1996). Today, the cove still serves as a key stopover and supply center for fishermen and the year-round community is also made up largely of fishing households. In the 1980s a school was completed that also functions as a community center (ADF&G 1994).

Elfin Cove is an unincorporated community. The community has a local Fish and Game Advisory Committee. Elfin Cove is accessible by float plane from Juneau (ADF&G 1994).

Economy

Elfin Cove has been characterized by a seasonal economy with its peak during the summer fishing season. The majority of Elfin Cove fishermen are hand trollers. Besides commercial fishing, other employment is provided by the school, local air carriers, communications and utilities services, and other small businesses which serve the fishing community (ADF&G 1994). Tourism has recently become more important to Elfin Cove. Two lodges operate out of the community. Unemployment in this census area in 1994 was 10.6 percent, compared to a rate for all Southeast of 8.2 percent (*Alaska Economic Trends* 4:1995). The 1989 median household income was $43,125 (ADCRA 1995).

Opinions

A number of Elfin Cove residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Elfin Cove residents who responded to the issues requested that the current timber sale program be reduced and that the long-term contract be terminated. Those providing oral testimony do not want logging or roads in the vicinity of Elfin Cove. They want current logging practices changed to selective harvest and logging to continue only in those areas currently roaded and logged. They stated that logging should be the last consideration when looking at economic and lifestyle priorities.

Subsistence Use

In 1987, the per capita subsistence harvest in Elfin Cove was 264 edible pounds. All households harvested some subsistence resource. Most commonly used (by over 50% of households) were chinook and coho salmon, halibut, cod, rockfish, deer, dungeness, king and Tanner crab, clams, shrimp, wood, and berries (TRUCS 1989).

Based on edible pounds harvested, salmon at 30 percent and deer and finfish other than salmon at 27 and 23 percent, respectively, are the most important subsistence resources for Elfin Cove households. Elfin Cove hunters travel an average of six miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Elfin Cove households have ever used to hunt deer. Summarizing, the majority of Elfin Cove households hunt deer in Wildlife Analysis Areas (WAA's) 3420, 3421, and 3418. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 3421 (17 deer), and 3418 (4 deer) (ADF&G 1994). These WAA's are virtually roadless.

Direct, Indirect, and Cumulative Effects

Commercial fishing, recreation and tourism, and subsistence use are important to Elfin Cove.

Commercial fishing is not expected to be significantly affected by Forest Service activities during the next ten years.

Tourism has recently become more important to Elfin Cove. Two lodges operate out of the community. Recreation and tourism is expected to increase by the same amount in all alternatives, thereby benefiting the retail store and lodges.

The Socio-economic Panel's assessment for Elfin Cove used in evaluating the effects described above resulted in the following estimated effects on community indicators:

ELFIN COVE	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇑/⇔	⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓
Resource jobs - rec/tourism	⇑/⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇓/⇔
Community stability	⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇓/⇔
Quality of life	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇓
Recreation opportunities	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇓/⇔
Access to traditional lifestyle	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇓/⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 63 percent of the total edible pounds of subsistence resources harvest by Elfin Cove households (Kruse and Frazier 1988).

Table 3-125 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Elfin Cove's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Elfin Cove hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Elfin Cove residents, as well as for all deer hunted within the WAA's. Deer account for 27 percent of the total edible pounds of subsistence resources harvested by Elfin Cove households (Kruse and Frazier 1988).

Table 3-125. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Elfin Cove residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Elfin Cove Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
3421	17	85	790	790	790	790	790	790	790	790	790	741
3418	4	107	1744	1744	1744	1744	1744	1744	1744	1744	1744	1611
Total	21	192	2534	2534	2534	2534	2534	2534	2534	2534	2534	2352
% Change in Habitat Capability From 1995:				0	0	0	0	0	0	0	0	-7.2
Elfin Cove Harvest % of 2095 Capability:				0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9
Total Harvest % of 2095 Capability:				7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	8.2

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

In terms of subsistence use, Icy Strait, northwest Chichagof Island, and Yakobi Island are the most important to Elfin Cove. These areas are legislatively withdrawn from timber harvest as either Wilderness or LUD II or allocated to the Semi-Remote Recreation LUD in all alternatives except 9. Alternative 9 allows timber harvest in the non-legislated areas of Lisianski Inlet and Strait, although opportunities are very limited and no timber harvest is scheduled.

Indirectly, it is unlikely that Elfin Cove will be affected by increased competition or access because of the limited area open for development. The current limited access is unlikely to draw additional hunters into the area due to displacement.

Gustavus

Gustavus is located in northern Southeast Alaska on the north shore of Icy Straits, east of the entrance to Glacier Bay. Its population is 301, of whom 3.9 percent are Alaska Native (ADCRA 1995). Prior to the founding of the present community, Huna Tlingit used the land and resources on which Gustavus is now located. Use of a salmon camp near the mouth of the Salmon River was noted by early Gustavus settlers, however, after a short period of settlement of the new community, Natives generally discontinued use of the camp (ADF&G 1994).

Gustavus was settled and named "Strawberry Point" in 1914 by a small group of immigrants from the Lower 48 planning to develop the land as agricultural homesteads. World War II brought development to Gustavus in the form of an airstrip and Federal Aviation Administration communications facilities. Nearby Glacier Bay National Monument was established in 1925 (ADF&G 1994).

Economy

The commercial fishing industry has provided some employment and income to local families throughout the community's history. Recently, some residents have entered the sport fishing charter business. Small livestock holdings continue to be operated in Gustavus. Self-employment in trapping, construction, and cottage industries have provided income to some residents. The Glacier Bay Lodge, tours and park attract a number of tourists and recreationists during summer months. The growth of services for Park visitors has increased seasonal employment opportunities (ADF&G 1994).

Fisheries, recreation and tourist services are Gustavus' principal economic sectors. The median household income in 1989 was $41,538 (ADCRA 1995). Unemployment in this census area in 1994 was 10.6 percent, compared to a rate for all Southeast of 8.2 percent (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita household subsistence harvest in Gustavus was 257 edible pounds. All households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho salmon, halibut, Dolly Varden, deer, dungeness crab, berries, and wood (TRUCS 1989).

Based on edible pounds harvested, finfish other than salmon at 31 percent, deer at 26 percent and salmon at 21 percent are the most important subsistence resources for Gustavus households. Gustavus hunters travel an average of eight miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Gustavus households have ever used to hunt deer. Summarizing, the majority of Gustavus households hunt deer in Wildlife Analysis Areas (WAA's) 4222, 4252, and 4256. As displayed on the Deer Harvest by Community map (in the map packet), these areas are relatively close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 4256 (51 deer), and 4222 (20 deer) (ADF&G 1994). These WAA's are virtually roadless.

Opinions

A number of Gustavus residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Gustavus residents who responded to the issues requested that additional emphasis be placed on scenic quality, recreation, fish, old-growth habitat around their community, and subsistence. They want the current timber sale program reduced and the long-term contracts terminated; many would like to have clearcut logging stopped Forest-wide. Those who responded do not want additional roads, log transfer facilities, or connection to other existing roads, and favor existing emphasis on mineral exploration and development. Respondents requested that management emphasize tourism, fishing, wildlife, recreation, scenic quality and subsistence in and around their community. They want no more logging on the Chilkat Range.

Direct, Indirect, and Cumulative Effects

Gustavus is a small community located near Glacier Bay National Park. Recreation and tourism are important to Gustavus, especially related to use of the National Park. Commercial fishing and subsistence use are also important to the community.

Recreation and tourism use is expected to increase by roughly the same amount in all alternatives. This would benefit the lodge, retail sales, and the various “bed and breakfasts” located in Gustavus.

Commercial fishing is not expected to be significantly affected by Forest Service activities in any alternative.

Logging would be allowed on the Chilkat Range in Alternatives 2, 4, 5, 6, 7, and 9. Much of the area of concern to the community is allocated to the Old Growth Habitat LUD in Alternatives 3 and 8.

The Socio-economic Panel’s assessment for Gustavus used in evaluating the effects described above resulted in the following estimated effects on community indicators:

GUSTAVUS	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇓/⇔	⇔	⇔	⇔	⇔	⇓	⇓	⇓
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇓/⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Community stability	⇑/⇔	⇓/⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Quality of life	⇑	⇓/⇔	⇔	⇔	⇔	⇔	⇓	⇓	⇓
Recreation opportunities	⇑	⇓/⇔	⇔	⇔	⇔	⇔	⇓	⇓	⇓
Access to traditional lifestyle	⇑	⇓/⇔	⇔	⇔	⇔	⇔	⇓	⇓	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 63 percent of the total edible pounds of subsistence resources harvest by Gustavus households (Kruse and Frazier 1988).

Table 3-126 displays the estimated level of deer habitat capability within the WAA’s where 75 percent of Gustavus’s subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Gustavus hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Gustavus residents, as well as for all deer hunted within the WAA's. Deer account for 70 percent of the total edible pounds of subsistence resources harvested by Gustavus households (Kruse and Frazier 1988).

Table 3-126. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Gustavus residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harves From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Gustavus Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
4256	51	66	781	781	781	781	781	781	781	781	781	781
4222	20	170	2021	1998	1608	1714	1769	1769	1616	1599	1706	1599
Total	71	236	2802	2779	2389	2495	2550	2550	2397	2380	2487	2380
% Change in Habitat Capability From 1995:				-0.8	-14.7	-11.0	-9.0	-9.0	-14.5	-15.1	-11.2	-15.1
Gustavus Harvest % of 2095 Capability:				2.6	3.0	2.8	2.8	2.8	3.0	3.0	2.9	3.0
Total Harvest % of 2095 Capability:				8.5	9.9	9.5	9.3	9.3	9.8	9.9	9.5	9.9

The majority of subsistence use by Gustavus is unlikely to be directly affected by any of the alternatives because of LUD II and Wilderness designations. Outside of these designations, Alternatives 7 and 9 could have direct impacts to the beach zones where much of Gustavus' hunting occurs.

Indirectly, it is unlikely that Gustavus will be affected by increased competition or access because access is already limited with few opportunities to expand.

Haines

Haines is located in the northern portion of Southeast Alaska, near the north end of Lynn Canal on the Chilkat Peninsula. Haines is one of three Southeast communities connected by road to Canada and the Lower 48. The population of the city is 1,521, with the outer Haines area home to another 968 people. Alaska Natives comprise 13.2 percent of the Haines area population (ADCRA 1995).

Originally the Haines area was settled by the Chilkat Tlingits. These Natives are now considered as two groups: the Chilkats of the Chilkat River, with Klukwan being the major population center, and the Chilkoots living in and near Haines. Haines itself was a trade center and mission site (ADF&G 1994).

Settlement did not concentrate in Haines until the late 1800s. The commercial fishing industry located several canneries in the Chilkat Inlet near Haines beginning in 1882; the Klondike gold rush brought thousands of prospectors to the town in the late 1890s; and the Dalton Trail was established as an open access route into the interior in the 1890s. Haines incorporated as a city in 1910 and as a third class borough in 1968 (ADF&G 1994).

Haines is a major trans-shipment point because of its ice-free, deep-water port and dock, and year-round road access to Canada and Interior Alaska on the Alaska Highway. It is a northern terminus of the Alaska Marine Highway System, and a hub for transportation to and from southeast Alaska (ADCRA 1994).

Economy

Haine's principal economic sectors are retail trade, construction, fisheries, and business. The Chilkoot Lumber Mill, once employing 100 people, closed in 1991. Some logging, mostly associated with State forests, still occurs in the Haines area. Tourism has recently been increasing in importance to Haines. A commercial gillnet fishing fleet operates out of Haines; some of the fishing fleet also participate in salmon troll and crab fisheries in Lynn Canal and farther south.

Unemployment in the Haines Borough in 1994 was 10.7 percent, compared to 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995). The 1989 median household income was $36,048 (ADCRA 1995).

Subsistence Use

In 1984, the per capita household subsistence harvest in Haines was 104 edible pounds. More than 82 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were sockeye salmon, trout, halibut, char, and berries (TRUCS 1989).

Based on edible pounds harvested, finfish other than salmon at 36 percent, salmon at 27 percent, and deer at 15 percent are the most important subsistence resources for Haines households. Haines hunters travel an average of 120 miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Haines households have ever used to hunt deer. Summarizing, the majority of Haines households hunt deer in Wildlife Analysis Areas (WAA's) 4222, 3629, and 3420. As displayed on the Deer Harvest by Community map (in the map packet), these areas are quite a distance from the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 4222 (89 deer), 3629 (28 deer), and 3420 (27 deer) (ADF&G 1994). These WAA's cannot be accessed from the ferry system.

Opinions

A number of Haines residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Opinion in Haines was split regarding recreation management with half wanting more emphasis on recreation and half satisfied with the current mix of emphasis. Residents who responded to the issues recommended that old-growth habitat near their community be maintained and that more emphasis be placed on subsistence. They were divided on timber management with some wanting less emphasis, some wanting the current emphasis, and some wanting more emphasis to support the local mills. Most of those who responded do not want additional roads or additional log transfer facilities.

Direct, Indirect, and Cumulative Effects

Commercial fishing, recreation and tourism, and subsistence use are important to Haines. Haines has an Alaska Marine Highway System ferry terminal and provides road access into Interior Alaska. Timber harvest on State lands and wood processing had been a major sector of the Haines economy in past years, but is no longer. Mining at the Kensington Mine southeast of Haines may become a major employer within the planning period; although the major mine support is anticipated to be located in Juneau, it is likely that some benefits would accrue to Haines.

Recreation and tourism use is expected to increase by roughly the same amount in all alternatives. This would benefit the hotels, retail sales, air taxis, and the various other tourist facilities located in Haines.

Commercial fishing is not expected to be significantly affected by Forest Service activities in any alternative.

Mining, and the opening of the Kensington Mine, is not anticipated to be affected differently by any alternative.

The Socio-economic Panel's assessment for Haines used in evaluating the effects described above resulted in the following estimated effects on community indicators:

HAINES BOROUGH	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Community stability	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Quality of life	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Recreation opportunities	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇓/⇔
Access to traditional lifestyle	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 68 percent of the total edible pounds of subsistence resources harvest by Haines households (Kruse and Frazier 1988).

Table 3-127 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Haines' subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Haines hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Haines residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability and all alternatives may have future inadequate habitat capability for the total deer hunted. At some point, a restriction in hunting may be necessary. Deer account for 15 percent of the total edible pounds of subsistence resources harvested by Haines households (Kruse and Frazier 1988).

Table 3-127. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Haines residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harves From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Haines Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
4222	89	170	2021	1998	1608	1714	1769	1769	1616	1599	1706	1599
3629	28	161	1706	1673	1162	1309	1379	1379	1183	1040	1251	1232
3420	27	94	471	472	472	472	472	472	472	472	472	472
3630	14	37	468	469	324	337	383	383	325	259	321	323
4253	14	123	1042	1042	695	1042	1042	1042	1042	733	904	592
3526	11	191	1180	1118	777	1118	1118	1118	1118	693	940	711
2202	11	8	140	140	140	140	140	140	140	86	104	86
3312	11	141	410	410	319	410	410	410	410	283	355	311
3421	10	86	790	790	790	790	790	790	790	790	790	741
3418	9	110	1744	1744	1744	1744	1744	1744	1744	1744	1744	1611
4252	5	206	477	477	311	477	477	477	477	301	370	301
Total	229	1327	10449	10333	8342	9553	9723	9723	9317	8000	8957	7979
% Change in Habitat Capability From 1995:				-1.1	-20.2	-8.6	-6.9	-6.9	-10.8	-23.4	-14.3	-23.6
Haines Harvest % of 2095 Capability:				2.2	2.7	2.4	2.4	2.4	2.5	2.9	2.6	2.9
Total Harvest % of 2095 Capability:				12.8	15.9	13.9	13.6	13.6	14.2	16.6	14.8	16.6

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

The majority of Haines' subsistence use areas are not on the National Forest, or in legislated LUD II and Wilderness Areas, and will not be impacted by any of the alternatives. Within the National Forest areas used by Haines residents, WAA's 4253, 3526, 3312, 3421, and 4252 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. With little timber harvest activity, Alternative 1 would provide the least potential impact on Haines' subsistence uses. Those areas Haines hunters use outside of LUD II and Wilderness are likely to be impacted by timber harvest activity in Alternatives 2, 7, and 9. Alternatives 3, 6, and 8 do not allow timber harvest in a portion of Haines' use area with the allocation to the Old Growth Habitat LUD. Alternatives 4 and 5 have longer rotations which would provide Haines with a higher level of older forest within the development LUD's they use.

As hunters from Haines travel some distance to hunt already, alternatives which may increase access from the ferry system (2 - 9) may decrease their cost of accessing areas to hunt. But with this additional access would likely come an increase in competition from hunters of other communities. In some cases this competition may cause Haines hunters to travel even farther. In places where access is likely to remain limited, the increase in competition may not occur.

Hollis

Hollis is located on east Prince of Wales Island, 19 miles east of Craig. The population is 95, with 3 percent Alaska Native (ADCRA 1995).

Settlement at Hollis began as a mining camp at the turn of the century, then developed into a logging camp in the mid-1950s. In 1960, when Thorne Bay became center of the logging industry on central Prince of Wales Island, most Hollis residents moved to Thorne Bay. In recent years, Hollis has grown as a community, due in part to an Alaska Marine Highway terminal there. Roads now connect Hollis with most other communities on Prince of Wales Island. A State land sale at Hollis in 1980 led to its present status as a permanent community (ADF&G 1994).

Economy

Hollis' principal economic sectors include timber, transportation services, highway maintenance and schools. The economy is highly seasonal in all sectors except government. The 1989 median household income was $31,250 (ADCRA 1995). Unemployment in this census area in 1994 was 12.5 percent, compared to 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita household subsistence harvest in Hollis was 164 edible pounds. More than 87 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho and sockeye salmon, halibut, rockfish, deer, clams, dungeness crab, sea cucumber, berries, and wood (TRUCS 1989).

Based on edible pounds harvested, salmon at 27 percent, deer at 23 percent and finfish other than salmon at 22 percent are the most important subsistence resources for Hollis households. Hollis hunters travel an average of 20 miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Hollis households have ever used to hunt deer. Summarizing, the majority of Hollis households hunt deer in Wildlife Analysis Areas (WAA's) 1316, 1317, and 1211. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 1317 (8 deer), and 1421 (6 deer) (ADF&G 1994). These WAA's are 41 and 58 percent accessible by existing roads.

Opinions

A number of Hollis residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

The Hollis Community Council, Inc. requested that additional emphasis be placed on managing for scenic resources, recreation, and fish. They indicated that current emphasis on subsistence is adequate and express opposition for timber harvest north of their community. The Council requested that the current timber sale program be reduced, and that the long-term contracts be terminated. Hollis residents asked for non-development allocations for specific areas near their community.

Direct, Indirect, and Cumulative Effects

Hollis is the site of the ferry terminal accessing the rest of Prince of Wales Island. As such, transportation is a major component of the community's economy. Subsistence and timber also play important roles.

The ferry terminal would continue to provide important access to Prince of Wales Island in all alternatives. Ferry access has become increasingly important to all of Prince of Wales as the Island's population continues to grow. Recreation use is projected to increase roughly to the same degree in all alternatives, thereby increasing use of the ferry system. However, since Alternatives 1, 4 and 5 essentially halt timber harvest on north Prince of Wales Island, the resulting declines in timber employment could have a ripple effect and reduce use of the ferry system. This would be especially true during September through May when recreation and tourism use is much lower.

Timber employment is another element for the community of Hollis. There would likely be insufficient volume to keep the Klawock mill open in Alternatives 1, 4, or 5. This would result in the loss of jobs on Prince of Wales. In addition, Alternatives 1, 4, and 5 essentially eliminate all intensive timber harvesting on the north end of the island. Although some individual tree selection opportunities would be available it amounts to less than 2 MMBF in any alternative and would most likely be purchased by very small operators for products such as music wood or cedar shakes. Residents who want to stay in the logging industry would either have to relocate or travel to remote logging camps elsewhere during the week for employment.

The Socio-economic Panel's assessment for Hollis used in evaluating the effects described above resulted in the following estimated effects on community indicators:

HOLLIS	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇔	⇑	⇔	⇑/⇔
Resource jobs - comm. fishing	⇑/⇔	⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇓/⇔	⇔	⇔
Resource jobs - rec/tourism	⇑	⇑/⇓	⇑/⇔	⇑	⇑	⇑	⇓	⇓/⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇑/⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔
Economic structure/diversity	⇑/⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓/⇔	⇔	⇔
Community stability	⇑/⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓/⇔	⇔	⇔
Quality of life	⇑	⇓/⇔	⇔	⇑	⇑/⇔	⇑/⇔	⇓	⇓/⇔	⇓/⇔
Recreation opportunities	⇑	⇓	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓	⇓/⇔	⇓/⇔
Access to traditional lifestyle	⇑	⇓	⇑	⇑	⇑	⇑/⇔	⇓	⇔	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the Fish Section of this chapter). These resources account for 65 percent of the total edible pounds of subsistence resources harvest by Hollis households (Kruse and Frazier 1988).

Table 3-128. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Hollis residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harves From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
	Hollis	All	Habitat									
WAA*	Residents	Hunters	Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1317	8	75	992	971	727	864	835	886	830	661	800	653
1421	6	242	2442	2184	1579	1864	1850	2048	1958	1278	1697	1423
1420	4	121	790	790	534	790	790	790	790	516	571	517
1211	2	51	1768	1686	1312	1453	1481	1481	1345	1221	1419	1208
1315	2	172	2076	1907	1499	1606	1696	1717	1575	1412	1569	1402
Total	22	661	8068	7538	5651	6577	6652	6923	6498	5088	6056	5203
% Change in Habitat Capability From 1995:				-6.6	-30.0	-18.5	-17.5	-14.2	-19.5	-36.9	-24.9	-35.5
Hollis Harvest % of 2095 Capability:				0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.4	0.4
Total Harvest % of 2095 Capability:				8.8	11.7	10.1	9.9	9.5	10.2	13.0	10.9	12.7

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

Table 3-128 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Hollis' subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Hollis hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for the effort may decrease, and if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Hollis residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability for alternatives 2, 3, 6, 7, 8, and 9 and these alternatives may have future inadequate habitat capability for the total deer hunted. At some point, a restriction in hunting may be necessary. Deer account for 23 percent of the total edible pounds of subsistence resources harvested by Hollis households (Kruse and Frazier 1988).

WAA 1420 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. Alternative 1 is unlikely to have direct impacts on Hollis' subsistence use since little timber harvest activity would occur. Alternatives 2- 9 may directly impact Hollis' subsistence use areas through allocation of development LUD's. Alternatives 3, 6, and 8 maintain Old Growth Habitat LUD's within a major portion of Hollis' subsistence use areas. This may decrease the impacts of continued harvesting on Hollis' subsistence use. Alternatives 4 and 5 also are beneficial to Hollis' subsistence use areas because of the longer timber rotation which better maintains habitat over time.

Hollis is currently competing with other communities in their subsistence use areas and under all alternatives that is likely to continue. Alternatives increasing access by roads due to timber harvest activity may increase competition from other communities on Prince of Wales Island and, because Hollis is on the ferry system, hunters from other islands and the mainland would be able to access the road systems through Hollis. This increase in people may be beneficial to Hollis' economy, but may cause hunters in Hollis to travel farther for deer and compete with hunters from more communities.

Hoonah

Hoonah is located along Icy Strait on the northeast shore of Chichagof Island, 40 air miles west of Juneau. Hoonah is predominantly a Native community and has been the principal village for the Hoonah Tlingit Clans since the late 1800s. Its population is 918, with 68 percent Native. Whitestone Logging Camp, with a population of 170, is adjacent to Hoonah. Children from the camp attend school in Hoonah (ADCRA 1995).

The village of Hoonah has been occupied since prehistoric times by the Tlingit people. Groups of *Huna* Tlingit lived all or part of the year at seasonal camps and small winter settlements throughout the Huna territory. Dozens of camps and settlements have been documented through archaeological surveys. The Hoonah Tlingit have very close ties to the Glacier Bay area across Icy Strait.

In 1880, the Northwest Trading Company built a store in Hoonah. The following year, missionaries settled in the town and established the Presbyterian Home Mission church and school. By 1887, about 500 people were wintering in the village. When the post office was established in 1901, the village was officially named Hoonah which means "village by the cliff" in Tlingit. In 1944, fire burned many homes in Hoonah and destroyed the traditional ceremonial costumes and keepsakes of the villagers. The town has since been rebuilt and has become a center for logging operations on northern Chichagof Island (ADF&G 1994). The logging operations use the Long Island Log Transfer Facility.

The community has a local Fish and Game Advisory Committee (ADF&G 1994).

Economy

Major fisheries and canneries were established in the area between 1880 and 1910. Hoonah residents adopted the new commercial fisheries into their local economy, and developed a strong commercial fishing fleet which continues to play an important role in Hoonah's economy and way of life. In 1982, Huna Totem Corporation entered into a timber contract with Timber Pacific of Washington to harvest its 22,000 acres of timber. A total of 3,075 acres were logged through 1985. The timber industry developed rapidly in the area near Hoonah, while the commercial fishing fleet remained relatively strong (ADF&G 1994).

Hoonah's principal economic sectors are fish and fish processing, retail trade, and timber. Its economy is highly seasonal in all sectors. The 1989 median household income was $36,442 (ADCRA 1995). Unemployment in this census area in 1994 was 10.6 percent, compared to 8.2 percent in all Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

Hoonah residents harvest many subsistence resources including deer, furbearers, seals, salmon, marine fish, waterfowl, other birds, shellfish, berries and seaweed. The 1987 harvest of these resources was 404 pounds per capita, with subsistence providing 50 percent of the household meat supply (Eight Fathom DEIS, p. 3-95). Ninety-five percent of the households harvested some subsistence resource. Most commonly used (by over 50% of households) were chinook, pink and coho salmon, halibut, Dolly Varden, herring roe on kelp, deer, seal, clams and cockles, dungeness crab, berries, and wood (TRUCS 1989).

Based on edible pounds harvested, salmon at 26 percent, deer at 23 percent and finfish other than salmon at 19 percent are the most important subsistence resources for Hoonah households. Hoonah hunters travel an average of 15 miles to their most reliable deer hunting areas (Kruse and Frazier 1988). Principal deer use areas identified by Hoonah residents extend from Seal Bay (in Tenakee Inlet) to Trap Bay. The beach fringe in Basket Bay extending over to Finger Creek in Peril Strait is also an important deer hunting area (Southeast Chichagof FEIS, p. 3-86).

Appendix C provides detailed maps regarding the areas that Hoonah households have ever used to hunt deer. Summarizing, the majority of Hoonah households hunt deer in Wildlife Analysis Areas (WAA's) 3524, 3551, and 4253. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 3523 (93 deer) and 3551 (78 deer) (ADF&G 1994). These WAA's are 31 and 37 percent accessible by existing roads.

Direct, Indirect, and Cumulative Effects

Commercial fishing, logging, and subsistence use are important to Hoonah. Most residents who are dependent on the logging industry live at the nearby Whitestone Camp.

Commercial fishing is not expected to be significantly affected by Forest Service activities in any alternative.

Logging employment will have the greatest variation among the alternatives. Alternative 1 would essentially eliminate logging opportunities for Hoonah, except on private lands. Alternatives 4, 5, and 6 significantly reduce logging opportunities on National Forest lands over the next ten years. Individuals who want to remain associated with the logging industry may have to relocate, find other employment or commute long distances to remote logging camps during the week. This could affect the community stability. Loss of their income could also have a ripple effect on the retail and services industry. Alternatives 2, 3, 7, 8 and 9 should continue to provide opportunities for logging employment.

The Socio-economic Panel's assessment for Hoonah used in evaluating the effects described above resulted in the following estimated effects on community indicators:

HOONAH	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇑	⇔	⇑	⇔	⇔	⇑	⇑/⇔	⇑/⇔
Resource jobs - comm. fishing	⇑	⇓/⇔	⇑/⇔	⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓
Resource jobs - rec/tourism	⇑	⇓	⇑/⇔	⇓/⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔	⇔	⇓/⇔
Community stability	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇓/⇔
Quality of life	⇑/⇔	⇓	⇓/⇔	⇓/⇔	⇑	⇔	⇓	⇔	⇓
Recreation opportunities	⇑/⇔	⇓/⇔	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇓	⇓/⇔	⇑/⇔
Access to traditional lifestyle	⇑	⇓/⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓/⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 59 percent of the total edible pounds of subsistence resources harvest by Hoonah households (Kruse and Frazier 1988).

Table 3-129 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Hoonah's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Hoonah hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Hoonah residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability and all alternatives may have future inadequate habitat capability for the total deer hunted. At some point, a restriction in hunting may be necessary. Deer account for 23 percent of the total edible pounds of subsistence resources harvested by Hoonah households (Kruse and Frazier 1988).

Table 3-129. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Hoonah residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer Habitat Capability	Deer Habitat Capability by Alternative at 2095								
WAA*	Hoonah Residents	All Hunters		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
3523	93	169	1169	1103	767	1103	1103	1103	1103	732	937	696
3551	78	225	1618	1618	942	1618	1618	1618	1618	877	1142	848
4253	70	123	1042	1042	695	1042	1042	1042	1042	733	904	592
4222	64	170	2021	1998	1608	1714	1769	1769	1616	1599	1706	1599
Total	305	687	5850	5761	4012	5477	5532	5532	5379	3941	4689	3735
% Change in Habitat Capability From 1995:				-1.5	-31.4	-6.4	-5.4	-5.4	-8.1	-32.6	-19.8	-36.2
Hoonah Harvest % of 2095 Capability:				5.3	7.6	5.6	5.5	5.5	5.7	7.7	6.5	8.2
Total Harvest % of 2095 Capability:				11.9	17.1	12.5	12.4	12.4	12.8	17.4	14.7	18.4

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

WAA's 3523, 3551, and 4253 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6.

All the alternatives, except 7 and 9, do not allow timber harvest in the beach fringe decreasing the direct impact to Hoonah's hunting along the shoreline. The Old Growth Habitat LUD in Alternatives 3, 6, and 8 include locations within Hoonah's subsistence use areas; this LUD allows no timber harvest and would likely benefit Hoonah subsistence users. A large portion of Hoonah's subsistence use areas are likely to be harvested and roaded under Alternatives 2-9. The impacts on the habitat may directly affect Hoonah's hunting. Indirectly, these alternative are likely to increase competition as hunters from outside the community are able to gain greater access from the ferry system and the increase in roads.

Hydaburg

Hydaburg is located on the southwest side of Prince of Wales Island, 45 air miles northwest of Ketchikan. Hydaburg has a population of 422, with 89 percent Alaska Native (ADCRA 1995).

The Haida Indians migrated to Prince of Wales Island, a predominantly Tlingit area, from Graham Island, Canada. After combining three villages, the present site was chosen initially as the Hydaburg Indian Reservation in 1912. It became a fishing village with the first fish processing plant opening in 1927, and three other canneries operating through the 1930s. Seafood processing was active until 1984 when a fire destroyed the cannery (ADF&G 1994). Hydaburg is connected by road to Craig, Klawock, Hollis and northern parts of the Island.

In 1936, Hydaburg became the first Alaskan Native village to form an Indian Reorganization Act Council. In 1972, Hydaburg incorporated as a first class city. The community has a local Fish and Game Advisory Committee (ADF&G 1994).

Economy

Hydaburg's current employment is highly seasonal in all sectors. This census area had an unemployment rate in 1994 of 12.5 percent, compared to 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995). Hydaburg has a fisheries-based economy, with timber and educational services also playing a role in the economy. The 1989 median household in Hydaburg was $20,139 (ADCRA 1995).

Subsistence Use

In 1987, the per capita household subsistence harvest in Hydaburg was 337 edible pounds. Ninety-one percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho, chinook, and sockeye salmon, rockfish, halibut, herring roe on kelp, hooligan, dungeness crab, clams and cockles, shrimp, abalone, seaweed and kelp, berries, and wood (TRUCS 1989).

Based on edible pounds harvested, salmon at 40 percent, finfish other than salmon at 16 percent and deer at 13 percent are the most important subsistence resources for Hydaburg households. Hydaburg hunters travel an average of 18 miles to their most reliable deer hunting areas (Kruse and Frazier 1988). To some degree, all Hydaburg household rely on subsistence resources for daily food. Hydaburg residents share substantial amounts of subsistence foods with friends and relatives in other communities (Control Lake DEIS, p. 3-149).

Appendix C provides detailed maps regarding the areas that Hydaburg households have ever used to hunt deer. Summarizing, the majority of Hydaburg households hunt deer in Wildlife Analysis Areas (WAA's) 901, 1107, and 1332. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 1332 (11 deer) and 1319 (10 deer) (ADF&G 1994). These WAA's are 21 and 47 percent accessible by existing roads.

Opinions

A number of Hydaburg residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Hydaburg residents who responded to the issues indicated the current mix of management for fish, wildlife and timber harvesting is appropriate and want to see the current timber sale program continued. Similarly, they believe the Forest Service has an obligation to maintain local and regional economies by continuing the long-term timber sale contracts. They are generally satisfied with existing road management and emphasis on mineral exploration and development. Respondents to the DEIS were dissatisfied with the land allocations in the Hydaburg area, wanting more emphasis on recreation and tourism, and less on timber harvesting.

Direct, Indirect, and Cumulative Effects

Subsistence use and commercial fishing are the primary elements of Hydaburg's economy.

Commercial fisheries employment is not likely to be affected by forest management activities to any significant degree during the next ten years.

The Socio-economic Panel's assessment for Hydaburg used in evaluating the effects described above resulted in the following estimated effects on community indicators:

HYDABURG	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇔	⇔	⇔	⇔	⇔	⇑	⇔	⇑/⇔
Resource jobs - comm. fishing	⇑	⇓/⇔	⇑/⇔	⇔	⇔	⇔	⇓	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇔	⇔	⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇑/⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇔	⇓/⇔
Community stability	⇑/⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇔	⇓/⇔
Quality of life	⇑	⇓/⇔	⇓/⇔	⇔	⇑	⇓/⇔	⇓	⇓	⇓
Recreation opportunities	⇑/⇔	⇓	⇑/⇓	⇑/⇔	⇑	⇓/⇔	⇓	⇓	⇓
Access to traditional lifestyle	⇑	⇓/⇔	⇓/⇔	⇓/⇔	⇑	⇓/⇔	⇓	⇓	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 80 percent of the total edible pounds of subsistence resources harvest by Hydaburg households (Kruse and Frazier 1988).

Table 3-130 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Hydaburg's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Hydaburg hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Hydaburg residents, as well as for all deer hunted within the WAA's. Deer account for 13 percent of the total edible pounds of subsistence resources harvested by Hydaburg households (Kruse and Frazier 1988).

Table 3-130. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Hydaburg residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994			Deer Habitat Capability by Alternative at 2095								
WAA*	Hydaburg Residents	All Hunters	1995 Deer Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1332	11	60	2104	2029	1560	1735	1766.2	1823.8	1687	1462	1698	1391
1319	10	299	2364	2364	1536	2364	2364	2364	2364	1374	1757	1373
901	7	38	1940	1864	1493	1643	1658.8	1658.8	1522	1231	1584	1204
1107	6	37	5703	5590	4704	5199	5109.4	5191.6	4926	3758	4816	3792
1420	4	107	790	790	534	790	790	790	790	516	571	517
Total	38	541	12901	12637	9827	11731	11688	11828	11289	8341	10426	8277
% Change in Habitat Capability From 1995:				-2.0	-23.8	-9.1	-9.4	-8.3	-12.5	-35.3	-19.2	-35.8
Hydaburg Harvest % of 2095 Capability:				0.3	0.4	0.3	0.3	0.3	0.3	0.5	0.4	0.5
Total Harvest % of 2095 Capability:				4.3	5.5	4.6	4.6	4.6	4.8	6.5	5.2	6.5

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

WAA's 1319 and 1420 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. Alternative 1 is unlikely to have direct impacts on Hydaburg' subsistence use with little timber harvest activity occurring. In Alternatives 2-9, the majority of WAA's where Hydaburg households hunt deer are allocated to development LUD's. Timber harvesting of these areas will likely have direct impacts on Hydaburg's subsistence use. Alternatives 3, 6, and 8, with lands allocated to the Old Growth Habitat LUD, would include some areas not available for timber harvest within Hydaburg's use area. This may decrease the impacts of continued harvesting on Hydaburg's subsistence use. Alternatives 4 and 5 with a longer rotation would likely maintain the habitat around Hydaburg over time.

All of the alternatives, except 7 and 9, offer no timber harvest for the beach fringe areas which are some of Hydaburg's more successful hunting areas. Alternatives 3, 6, and 8 may indirectly impact Hydaburg by displacing hunters from other communities with timber harvest activities outside of the Old Growth Habitat LUD's. Alternatives 2, 7, and 9 would likely increase access opportunities for Hydaburg hunters as timber harvesting activities continue. At the same time, the increased access may also bring in greater competition from other hunters taking advantage of the increased access.

Hyder

Hyder is a small community nestled at the head of Portland Canal, a 70-mile-long fjord which forms a portion of the U.S./Canadian border. Hyder is just 2 miles from Stewart, British Columbia, and 75 air miles from Ketchikan. Hyder is one of three Alaskan communities connected by road to Canada. Its population is less than, with 1 percent of its population Alaska Native (ADCRA 1995).

Nass River Tsimshians inhabited the area, which they called Skam-a-Kounst, "a safe place," prior to the coming of white prospectors in the late 1890s. The first official exploration and building at the town site occurred in 1896 by the U.S. Army Corps of Engineers. Stewart also became settled at this time, as gold, silver, and other mineral mining operations developed. The two towns grew together with an initial economic base in mining (ADF&G 1994).

Economy

Hyder, now billed as the "Friendliest Ghost Town in Alaska," began as a mining town before the turn of the century. It developed as a supply point for the Canadian mining district with a small amount of mining also done in the Hyder area. Most mining ended in the late 1950s. Today, tourism is the town's main industry (ADF&G 1994).

Since 1985 the Alaska Marine Highway has run weekly ferries to Hyder during the summer, increasing the local tourist trade. Tourism has become an economic mainstay for Hyder in recent years; it supports a handful of gift shops, two bars, and a gas station. Hyder's children attend schools in Stewart. Hyder has a local Fish and Game Advisory Committee; Hyder is unincorporated (ADF&G 1994).

Hyder's economy is based primarily on tourism, construction and commercial fishing and is highly seasonal. The 1989 median household income was $23,750 (ADCRA 1995). This census area had an unemployment rate in 1994 of 12.5 percent, compared to 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita subsistence harvest in Hyder was 401 edible pounds. Ninety-one percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho salmon, halibut, trout and char, dungeness crab, shrimp, berries, and wood (TRUCS 1989).

Based on edible pounds harvested, salmon at 30 percent, finfish other than salmon at 22 percent, and other mammals such as moose and bear at 16 percent are the most important subsistence resources for Hyder. Hyder hunters travel an average of 118 miles to their most reliable deer hunting area (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Hyder households have ever used to hunt deer. Summarizing, the majority of Hyder households hunt deer in Wildlife Analysis Areas (WAA's) 1003, 1323, and 1422. As displayed on the Deer Harvest by Community map (in the map packet), these areas are quite a distance from the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 1003 (1 deer), and 1422 (1 deer) (ADF&G 1994). These WAA's are 70 and 63 percent accessible by existing roads.

Opinions

A number of Hyder residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

The Hyder Community Association, Inc. requested that more emphasis be placed on managing for recreation and that additional road access to recreation areas be provided. They also want additional emphasis on fish and recommend that old-growth habitat near communities be maintained for wildlife. The Association indicated that the current emphasis on subsistence is adequate. They responded favorably to additional roads, transfer facilities, connecting existing roads, and placing more emphasis on mineral exploration and development. Other residents favored non-timber management and land allocations for the Hyder area.

Direct, Indirect, and Cumulative Effects

Hyder is a small former mining town which now relies upon tourism and commercial fishing for the majority of its income. No timber development activities are planned in the vicinity of Hyder in any of the alternatives. Although some of the lands along the Salmon River are allocated to LUD's which allow timber harvest in Alternatives 2, 3, 4, 5 and 6, there is no commercial timber harvest currently scheduled. The Scenic Viewshed LUD does allow for fuel wood use.

Tourism (especially bear viewing) has become increasingly important to the economy of Hyder. Recreation use is projected to increase roughly to the same degree in all alternatives, benefiting retail trade in Hyder.

Commercial fisheries employment is not likely to be affected by forest management activities to any significant degree during the next ten years.

The Socio-economic Panel's assessment for Hyder used in evaluating the effects described above resulted in the following estimated effects on community indicators:

HYDER	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇔	⇔	⇔	⇔
Resource jobs - comm. fishing	⇑/⇔	⇔	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇔	⇔
Resource jobs - rec/tourism	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇑/⇔
Community stability	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Quality of life	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑	⇑/⇔	⇔
Recreation opportunities	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇔
Access to traditional lifestyle	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑	⇑/⇔	⇓/⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 80 percent of the total edible pounds of subsistence resources harvest by Hyder households (Kruse and Frazier 1988).

Deer account for only a fraction of the total edible pounds of subsistence resources harvested by Hyder households (Kruse and Frazier 1988). Table 3-131 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Hyder's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Hyder hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Hyder residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability and all alternatives may have future inadequate habitat capability for the total deer hunted. At some point, a restriction in hunting may be necessary.

Table 3-131. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Hyder residents obtain approximately 75% of their average annual deer harvest

	Average Deer Harves From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Hyder Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1003	1	142	2639	1970	1565	1865	1771	1771	1638	1439	1859	1439
1422	1	343	3617	2556	2291	2447	2501	2535	2403	1940	2381	2210
Total	2	485	6256	4526	3856	4312	4272	4306	4041	3379	4240	3649
% Change in Habitat Capability From 1995:				-27.7	-38.4	-31.1	-31.7	-31.2	-35.4	-46.0	-32.2	-41.7
Hyder Harvest % of 2095 Capability:				0.04	0.05	0.05	0.05	0.05	0.05	0.06	0.05	0.05
Total Harvest % of 2095 Capability:				10.7	12.6	11.2	11.4	11.3	12.0	14.4	11.4	13.3

Alternative 1 is unlikely to have direct impacts on Hyder's subsistence use with little timber harvest activity occurring. In Alternatives 2-9 the majority of WAA's where Hyder households hunt deer are allocated to development LUD's and timber harvesting may impact Hyder's subsistence use. Alternatives 3, 6, and 8, which include allocations of the Old Growth Habitat LUD's, have reduced potential for timber harvest in a small area of Hyder's use area. Alternative 4 and 5 with a longer rotation would likely maintain the habitat within Hyder's use area over time. Overall, because deer do not account for much of Hyder's subsistence use, all alternatives are unlikely to significantly affect Hyder hunters.

The displacement of hunters that may occur in Alternative 2 - 9 with continued or increased timber harvesting would likely increase competition for subsistence resources. Impacts of increases in competition may not greatly affect Hyder hunters who are already traveling long distances for hunting. Indirectly, alternatives with opportunities for expanding access may benefit Hyder hunters with lower costs of access.

Juneau and Vicinity

The City and Borough of Juneau surrounds the Gastineau Channel in South east Alaska. It lies 900 air miles northwest of Seattle and 600 air miles southeast of Anchorage. The City and Borough are comprised of three communities: Juneau, Auke Bay and Douglas. The population is 29,078, making it the most populated community in Southeast Alaska. Almost 13 percent of this population is Alaska Native (ADCRA 1995).

Originally, Tlingit Indians made seasonal and permanent villages along the north and south coast near the present site of Juneau. Gold discovered in the Juneau area started the mining town in 1880 and the settlement grew rapidly. Two of the world's largest lode gold mines produced over $180 million in gold before finally closing in 1944. The state capital was moved from Sitka to Juneau in 1906 while Alaska was still a territory. Alaska became the 49th State in 1959. Juneau has developed as a government and regional services center, with added economic contributions from fishing and tourism.

Economy

As state capital, Juneau's economy is overwhelmingly supported by government and administration, with tourism another significant contributor during the summer months. Approximately 373,000 visitors arrive each year on cruise ships, with the Mendenhall Glacier being the premier attraction. Other major sectors include mining and fishing; minor economic sectors include retail trade, education services, other professional services, construction, and transportation. The 1989 median household income was $47,924 (ADCRA 1995). Unemployment in 1994 in the Juneau Borough was 6 percent, compared to a Southeast rate of 8.2 percent (*Alaska Economic Trends* 4:1995).

Recreation and Hunting Use Areas

The Tongass is primarily used for recreation by Juneau residents and visitors. Some 61,655 visitors took helicopter tours into the ice field above the town in 1995. Another 182,000 took bus tours to the Mendenhall Glacier Visitor Center. The four Forest Service cabins that are off the Juneau road system, as well as the 24 in the area, have regular use. The local cabins are used year-round.

Juneau residents also use the Tongass for hunting, fishing and hiking, although the community is not a subsistence community. There are an estimated 100 miles of hiking trails in the Tongass National Forest off the Juneau road system.

In recent years, there has been growing interest in ecotourism in the area. Outfitter guides take small groups on hikes or boat trips, with the goal of leaving as little mark on the environment as possible. Tourism involving the forest is expected to continue to increase.

Appendix C provides a detailed map regarding the areas that Juneau households have used to hunt deer. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 3835 (307 deer), 3836 (301 deer), and 4150 (226 deer) (ADF&G 1994). As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community.

Opinions

A number of Juneau residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Juneau residents who responded to the issues requested that additional emphasis be placed on scenic resources, recreation, fish, wildlife, and subsistence. Juneau residents are split in their opinion of managing the Forest to emphasize timber harvest. Half want the same mix of emphasis, half want less timber harvest. Those who responded favor additional roads, and connecting existing roads. They also expressed support for additional emphasis on access for mineral exploration and development.

Written and oral comments offered by Juneau residents reflected considerable differences of opinion. Some believe that timber harvest on the Tongass is occurring at too fast a rate, that subsistence effects are being ignored, and that watershed protection is inadequate. Others believe that an inadequate amount of timber is currently offered and that the Forest Service should provide for the expansion of the timber industry. Many residents expressed dissatisfaction with the application of the Minerals LUD to the Juneau area. Many also requested non-timber management for specific areas, especially Mansfield Peninsula.

Direct, Indirect, and Cumulative Effects

As the state capitol, government is important to Juneau. Besides changes in government employment, Juneau is most likely to be affected by changes in mining, recreation and tourism, and commercial fishing.

Mining has again become important to the community of Juneau. Greens Creek Mine is anticipated to restart operations within the next year (1996) and the Kensington Mine is expected to open within the next ten years. These developments would not be affected by any of the alternatives.

Recreation and tourism use is expected to increase by roughly the same amount in all alternatives. This should benefit retail and services sectors in Juneau.

Commercial fishing is not expected to be significantly affected by Forest Service activities in any alternative.

Local recreation activities (Juneau is not a rural community with subsistence priority) are centered around the Juneau roaded area, Admiralty Island, Taku Inlet and Lynn Canal (and the islands near Juneau). The recreation opportunities on National Forest lands should not be affected by timber harvest in any alternative. Although some lands are available for timber harvest in some alternatives, no harvest is scheduled.

The Socio-economic Panel's assessment for Juneau used in evaluating the effects described above resulted in the following estimated effects on community indicators:

JUNEAU	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇔	⇔	⇔	⇔	⇔	⇑	⇑/⇔	⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇑/⇔	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇔
Community stability	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Quality of life	⇑	⇓/⇔	⇔	⇔	⇔	⇔	⇓	⇓	⇓
Recreation opportunities	⇑	⇔	⇔	⇔	⇔	⇔	⇓	⇓	⇓/⇔
Access to traditional lifestyle	⇑	⇔	⇔	⇔	⇔	⇓/⇔	⇓	⇓	⇓/⇔

Table 3-132 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Juneau's hunting use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Juneau hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. Current deer harvest for Juneau hunters slightly exceeds 10 percent of habitat capability for all alternatives. Juneau and other hunters combined are currently harvesting close to 14 percent of habitat capability. Alternatives 7 and 9 come closer to 20 percent of habitat capability being harvested in year 2095. There is some likelihood of reduced success rate or potential restrictions for all alternatives. If a restriction would be necessary, sport hunting by Juneau residents would be restricted before subsistence hunting by rural residents is restricted.

Table 3-132. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Juneau residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harves From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Juneau Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
3835	307	319	907	907	907	907	907	907	907	907	907	630
3836	301	341	1592	1592	1592	1592	1592	1592	1592	1153	1254	1052
4150	226	228	953	953	953	953	953	953	953	953	953	953
2722	195	375	815	815	795	815	815	815	815	636	734	813
4148	169	162	1686	1685	1685	1685	1685	1685	1685	1685	1685	1685
4149	164	141	1388	1388	1388	1388	1388	1388	1388	1388	1388	1388
3526	163	191	1394	1394	777	1394	1394	1394	1394	693	940	711
4147	155	194	1007	1007	1007	1007	1007	1007	1007	1007	1007	1007
4145	151	159	1288	1288	1288	1288	1288	1288	1288	1288	1288	1288
3629	121	161	1830	1673	1162	1309	1379	1379	1183	1040	1251	1232
3938	114	267	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239
3525	113	210	2441	2441	1186	2441	2441	2441	2441	1080	1369	1168
4146	104	158	907	908	908	908	908	908	908	908	908	908
3417	100	222	2644	2643	2643	2643	2643	2643	2643	2643	2643	2624
4044	88	211	1264	1264	1264	1264	1264	1264	1264	1264	1264	1264
3551	88	225	1846	1520	942	1164	1190.6	1284.8	1128	877	1142	848
4222	81	170	2065	1998	1608	1714	1768.8	1768.8	1616	1599	1706	1599
3420	68	94	471	472	472	472	472	472	472	472	472	472
2621	64	72	163	163	163	163	163	163	163	91	113	163
Total	2772	3900	27900	27350	23979	26346	26497	26592	26086	22923	24263	23044
% Change in Habitat Capability From 1995:				-2.0	-14.1	-5.6	-5.0	-4.7	-6.5	-17.8	-13.0	-17.4
Juneau Harvest % of 2095 Capability:				10.1	11.6	10.5	10.5	10.4	10.6	12.1	11.4	12.0
Total Harvest % of 2095 Capability:				14.3	16.3	14.8	14.7	14.7	15.0	17.0	16.1	16.9

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

Juneau is not classified as a subsistence community, however many residents use the surrounding Tongass for hunting and fishing.

WAA's 3835, 2722, 3526, 3525, and 2621 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. Alternative 1 is unlikely to have direct impacts on Juneau's hunter use with little timber harvest activity occurring. In all alternatives, the majority of the area used by Juneau hunters is within Wilderness and will not be affected by any option. Alternatives 3, 6, and 8 allocate Old Growth Habitat LUD's within non-Wilderness areas hunted by Juneau residents , providing greater benefit to wildlife in these use areas. Alternative 4 and 5 with a longer rotation would likely maintain the habitat within these same use areas over time.

The displacement of hunters that may occur in Alternatives 2 - 9 with continued or increased timber harvesting would likely increase competition for deer. The impact of increased competition may not greatly affect Juneau hunters who already hunt in areas of limited access without opportunities to expand. Also, they are traveling long distances for hunting and may indirectly benefit with lower costs of access of alternatives that have opportunities for expanding access.

Kake

Kake is located on west Kupreanof Island, along Keku Strait, 38 air miles northwest of Petersburg. Kake's population is 758, with 74 percent of the residents Alaska Native (ADCRA 1995).

Tlingit Indians built villages and fishing camps in the Kake area in the early 1700s. During the 1800s these villages were consolidated at the present site of Kake. In the years following the American purchase of Alaska from Russia in 1867, there were several confrontations between the *Keex'* Tlingit and the Russian and American military administrations culminating in the destruction of three Kake villages. For many years, the *Keex"* people did not rebuild their villages. Eventually, they concentrated on Kupreanof Island at the present townsite along Keku Strait (ADF&G 1994).

The period of 1880-1915 brought a territorial government, missionary activity, economic innovations and a larger white population into *Keex"* Tlingit territory. By the 1920s, Kake had become self-governing, with a mayor and police chief. In 1949, Kake formed an IRA Council under the Indian Reorganization Act of 1936. In 1952, Kake became incorporated as a first class city. In 1971, the passage of ANCSA resulted in the incorporation of the village and the selection of corporation lands (ADF&G 1994).

Economy

Economic changes increased in the early 1900s as commercial development in the area began to expand and opportunities for wage earning increased. Commercial fishing, fur farming, trapping, and logging became the primary means of adding cash to the subsistence economy (ADF&G 1994).

The timber industry in the Kake area began in 1968, when the Soderberg Logging Company established a camp in Kake. In the early 1980s, as the market for timber declined and harvesting from public lands became less profitable, Soderberg Logging Company ceased its timber harvesting and began to build roads for Kake Tribal Corporation, which was beginning to log corporation lands on northern Kupreanof Island (ADF&G 1994).

Kake's major economic sectors are fishing and fish processing, and government services. Employment is highly seasonal. The 1989 median household income was $35,875 (ADCRA 1995). Unemployment in this census area in 1994 was 9.2 percent, compared to a Southeast rate of 8.2 percent (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita household subsistence harvest in Kake was 159 edible pounds. About 91 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho, chinook and sockeye salmon, halibut, herring roe on kelp, deer, seal, dungeness crab, clams and cockles, chitons, berries, seaweed and wood (TRUCS 1989).

Based on edible pounds harvested, deer at 24 percent, salmon at 22 percent and finfish other than salmon at 21 percent are the most important subsistence resources for Kake households (Kruse and Frazier 1988). Kake hunters travel an average of 28 miles to their most reliable deer hunting. A study of harvest and use of fish and wildlife by Kake residents indicates a high degree of conformity between contemporary use area and traditional deer hunting territories of the Kake Tlingit (Firman and Bosworth, 1990, *in* Shamrock Timber Sale EIS , p. 3-50). The majority of Kake's deer harvest comes from Wildlife Analysis Areas 3939 and 3940 at the southern portion of Admiralty Island.

Appendix C provides detailed maps regarding the areas that Kake households have ever used to hunt deer. Summarizing, the majority of Kake households hunt deer in Wildlife Analysis Areas (WAA's) 3938, 3939, and 3940. As displayed on the Deer Harvest by Community map (in the map packet), these areas are moderately close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 3940 (92 deer) and 3939 (46 deer) (ADF&G 1994). These WAA's are essentially roadless.

Opinions

A number of Kake residents offered oral and/or written testimony during the TLMP revision DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Kake Tribal Corporation, the City of Kake, and the Kake District Commissioner for Subsistence expressed concern for Security, Rowan, Pillar, Tebenkof and Kadake Bays, indicating these are important subsistence use areas particularly for salmon. They do not want logging in these areas. Others made similar comments, with all wanting no or reduced logging on north Kuiu Island.

Direct, Indirect, and Cumulative Effects

Kake is a traditional native community where commercial fishing, timber harvesting, and subsistence use are important. For subsistence use, west Kupreanof and north Kuiu Islands are some of the most important areas.

Commercial fishing is not expected to be significantly affected by Forest Service activities during the next ten years.

Timber harvest has been an important contributor to the Kake economy for approximately twenty years. During that period, both private and National Forest system lands have been harvested. Recently, timber harvest has diminished on both ownerships. Lands near Kake are available for timber harvest in all alternatives. Alternative 1, with no timber harvest scheduled, would result in the least amount of harvest. Alternatives 2, 7, and 9 could result in the highest amount of harvest and therefore largest contribution to Kake's economy. Other alternatives also allow for timber harvest, but would likely result in less of a contribution to the Kake economy.

The Socio-economic Panel's assessment for Kake used in evaluating the effects described above resulted in the following estimated effects on community indicators:

KAKE	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑	⇔	⇔
Resource jobs - comm. fishing	⇑	⇓/⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇓	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇓	⇑	⇑/⇔	⇑	⇑/⇔	⇓	⇓/⇔	⇓
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇓/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓
Community stability	⇔	⇓	⇔	⇔	⇑/⇔	⇑/⇔	⇓	⇓/⇔	⇓
Quality of life	⇑	⇓	⇑/⇓	⇔	⇑/⇔	⇑/⇔	⇓	⇓/⇔	⇓/⇔
Recreation opportunities	⇑	⇓/⇔	⇑/⇓	⇑/⇔	⇑/⇔	⇑/⇔	⇓	⇓/⇔	⇓
Access to traditional lifestyle	⇑	⇓	⇑/⇓	⇑/⇔	⇑/⇔	⇑/⇔	⇓	⇓	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 52 percent of the total edible pounds of subsistence resources harvest by Kake households (Kruse and Frazier 1988).

Table 3-133 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Kake's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Kake hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Kake residents, as well as for all deer hunted within the WAA's. Deer account for 24 percent of the total edible pounds of subsistence resources harvested by Kake households (Kruse and Frazier 1988).

Table 3-133. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Kake residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harves From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Kake Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
3940	92	244	2670	2669	2669	2669	2669	2669	2669	2669	2669	2669
3939	46	297	2976	2975	2975	2975	2975	2975	2975	2975	2975	2975
3938	18	267	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239
Total	156	808	8885	8883	8883	8883	8883	8883	8883	8883	8883	8883
% Change in Habitat Capability From 1995:				0	0	0	0	0	0	0	0	0
Kake Harvest % of 2095 Capability:				1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Total Harvest % of 2095 Capability:				9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1

Alternative 1 is unlikely to have direct impacts on Kake' subsistence use with little timber harvest activity occurring. The majority of WAA's where Kake households hunt are within Wilderness which will not change by alternative. A portion of Kake's use area is within a development LUD in Alternatives 2-9 which may be impacted by timber harvesting. In these same areas, Alternatives 3, 6, and 8 will provide some habitat maintenance with Old Growth Habitat LUD's. Alternatives 2, 4 and 5 also provide some wildlife habitat maintenance with recreation LUD's, with 4 and 5 also increasing habitat with longer rotations. Only Alternative 1 restricts all of Kake's use area from possible timber activity.

Indirectly, Alternatives 2, 7, 8, and 9 which may offer opportunities for expanding access may increase competition if hunters from other communities come to Kake's use area due to the increase in access linked to the ferry system. But because much of Kake's hunting already occurs in Wilderness areas with limited access, it is unlikely that competition in these areas would affect them.

Kasaan

Kasaan is a small village located on the eastern side of Prince of Wales Island 30 miles northwest of Ketchikan. Its population is 45, with 54 percent Alaska Native (ADCRA 1995).

Originally Tlingit territory, Kasaan gets its name from the Tlingit word meaning "pretty town." Haidas migrated north from the Queen Charlotte Islands in the early 1700s to the Island and established the village known as "Old Kasaan." In 1898 the Copper Queen mine, camp, sawmill, post office and store were built on Kasaan Bay, and the Haida people relocated to this new village (ADCRA 1994). The Haida village of Kasaan was settled at its present site in 1904 (ADF&G 1994).

Economy

Several canneries operated sporadically in the Kasaan area through the 1950s. Mining was another economic impetus for the community. In 1867, Baranovich discovered copper near New Kasaan and opened the Kasaan Bay Mining Company, offering new employment to the residents. However, lack of employment opportunities caused a steady decline in the population during the 20th century from 1900 to 1970 (ADF&G 1994).

Fisheries is the main economic source today. Kasaan's 1989 median household income was $46,667 (ADCRA 1995). The unemployment rate in this census area in 1994 was 12.5 percent, compared to a Southeast rate of 8.2 percent (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita subsistence harvest in Kasaan was 186 edible pounds. All households harvested some subsistence resource. Most commonly used (by over 50% of households) were chinook and sockeye salmon, cod, halibut, herring roe on kelp, deer, dungeness crab, clams and cockles, shrimp, berries, seaweed, and wood (TRUCS 1989).

Based on edible pounds harvested, invertebrates at 40 percent, deer at 22 percent and salmon and finfish other than salmon at 17 percent are the most important subsistence resources for Kasaan households. Kasaan hunters travel an average of seven miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Kasaan households have ever used to hunt deer. Summarizing, the majority of Kasaan households hunt deer in Wildlife Analysis Areas (WAA's) 1316, 1315, and 1214. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA 1315 (6 deer) (ADF&G 1994). This WAA is 57 percent accessible by existing roads.

Opinions

A number of Kasaan residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Kasaan residents expressed a desire to reduce the current timber sale program and requested emphasis on access for mineral exploration and development. They favored a road connection to Thorne Bay and other communities. Logging is acceptable, but should not be done at the expense of other resources.

Direct, Indirect, and Cumulative Effects

Subsistence use and commercial fishing are the primary elements of Kasaan's economy.

A road is currently planned for construction which would link the community with the rest of the Prince of Wales Island road system. This road system will give the community road access to the ferry terminal in Hollis. None of the alternatives would affect this planned road connection.

Commercial fisheries employment is not likely to be affected by forest management activities to any significant degree during the next ten years.

Most timber harvest in the vicinity is on private land owned by the Kasaan native corporation. Nearby National Forest System lands are not currently scheduled for harvest in all alternatives. Therefore, subsistence opportunities are unlikely to be affected by any of the alternatives.

The Socio-economic Panel's assessment for Kasaan used in evaluating the effects described above resulted in the following estimated effects on community indicators:

KASAAN	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑	⇔	⇑/⇔
Resource jobs - comm. fishing	⇑	⇓/⇔	⇑/⇔	⇔	⇔	⇔	⇓	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇑/⇔	⇔	⇔	⇑/⇔	⇑	⇔	⇓/⇔	⇔	⇓/⇔
Community stability	⇑/⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇔	⇓/⇔
Quality of life	⇑	⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓
Recreation opportunities	⇑	⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓
Access to traditional lifestyle	⇑	⇔	⇔	⇓/⇔	⇔	⇔	⇓	⇓/⇔	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 74 percent of the total edible pounds of subsistence resources harvest by Kasaan households (Kruse and Frazier 1988).

Table 3-134 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Kasaan's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Kasaan hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Kasaan residents. Alternatives 7 and 9 slightly exceed 10 percent of habitat capability and may have future inadequate habitat capability for the total deer hunted within the WAA's. Deer account for 22 percent of the total edible pounds of subsistence resources harvested by Kasaan households (Kruse and Frazier 1988).

Table 3-134. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Kasaan residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Kasaan Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1315	6	150	2076	1907	1499	1606	1696	1717	1575	1412	1569	1402
Total	6	150	2076	1907	1499	1606	1696	1717	1575	1412	1569	1402

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
% Change in Habitat Capability From 1995:	-8	-28	-23	-18	-17	-24	-32	-24	-32
Kasaan Harvest % of 2095 Capability:	0.3	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4
Total Harvest % of 2095 Capability:	7.9	10.0	9.3	8.8	8.7	9.5	10.6	9.6	10.7

WAA's 1319 and 1420 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6.

As a large portion of Kasaan households' use area is on non-National Forest System Lands, none of the alternatives will affect the habitat in that area. Alternative 1 is unlikely to have direct impacts on Kasaan's subsistence use with little timber harvest activity occurring. Alternative 2, 7 and 9 allocate much of Kasaan's use area to a development LUD. This may directly impact Kasaan's subsistence resource with the timber harvest activity likely to occur there. Alternatives 3, 6, and 8 maintain Old Growth Habitat LUD's within a major portion of Kasaan's use area. This may decrease the impacts of continued harvesting on Kasaan's subsistence use. Alternatives 4 and 5 also limit timber harvest in Kasaan's subsistence use areas with a longer rotation to maintain habitat over time.

Kasaan is currently competing with other communities in their subsistence use areas and this is likely to continue under all alternatives. Alternatives increasing access by roads due to harvest activity may increase competition from other communities on Prince of Wales Island indirectly impacting Kasaan's use. An increase in access may also allow Kasaan households to increase the range of their use.

Ketchikan & Vicinity

Ketchikan is located on Revillagigedo Island near the southernmost boundary of Alaska. It lies 679 miles north of Seattle and 235 miles south of Juneau. It is the first Alaska port-of-call for northbound ships. Ketchikan and its vicinity include Ketchikan, Saxman, Mountain Point, Clover Pass, Ward Cove and Herring Cove, which are located on the Ketchikan road system, and Pennock Island. The population of Ketchikan and vicinity is 14,923 (Alaska Dept. of Labor 1993). Native populations vary from a high of 80 percent in Saxman to a low of less than 8 percent in the Ketchikan suburbs. Ketchikan itself has a Native population of 15.7 percent (Kruse and Frazier 1988; ADCRA 1995). Refer to the section on Saxman for information directly relating to that community

The Ketchikan area was a summer fishing camp for the Tlingit Indians. Their name for the area, "kitschk-him," meant "thundering wings of an eagle." Its abundant fish and timber resources eventually attracted non-Natives, with its first cannery opening in 1886 and four more by 1912. Nearby gold and copper discoveries briefly brought activity to Ketchikan during the late 1890s, but timber and fishing became the chief economic forces at the turn of the century and have remained important. The 1954 construction of a pulp mill in Ward Cove continued a tradition begun by the 1903 opening of Ketchikan Spruce Mills which operated for more than 70 years. It has also remained an important hub for fishing, both for fish processing and as home to those with fishing permits.

Economy

Ketchikan is an industrial center and a major port of entry in Southeast Alaska. It has a large fishing fleet, fish processing facilities, timber and wood products manufacturing and tourism. The State operates a hatchery which contributes to the local salmon population. Cruise ships dock in the summer bringing in more than 300,000 tourists each season. The economy, in general, is diverse enough to provide stability in the professional, technical, and service sectors (ADF&G 1994).

Unemployment in this census area in 1994 was 8.3 percent, compared to 8.2 for the Southeast region (*Alaska Economic Trends* 4:1995). Average per capita income in 1992 was $27,761 (Ketchikan Gateway Borough (KGB), *Overall Economic Development Program,* 1994).

The KGB is now considering ways to diversify its economy further. These plans include improving fisheries services, such as building a cold storage, building an aquarium to enhance tourism, and constructing a bridge between Ketchikan and its airport (KGB 1994; ADCRA 1995).

Hunting and Recreation Use

Because Ketchikan is not a rural community, and therefore not classified as a subsistence community, it was not included in TRUCS. Ketchikan residents do use the Tongass for hunting and fishing.

Appendix C provides a detailed map regarding the areas that Ketchikan households have used to hunt deer. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 1421 (121 deer), 1422 (99 deer), and 613 (97 deer) (ADF&G 1994). As displayed on the Deer Harvest by Community map (in the map packet), some of these areas are close to, and some are quite a distance, from the community.

Opinions

A number of Ketchikan residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Individual respondents to the issues expressed an interest in being able to harvest timber along Alaska Marine Highway routes, roads, and streams, and around their community. However, the Ketchikan Chamber of Commerce recommended that some areas be cut progressively at a moderate rate rather than heavily at a rapid rate to maintain scenic quality and to display a multiple-use forest.

The Ketchikan State Parks Advisory Board recommended additional road access to recreation areas and the Chamber recommended developed recreation sites. Ketchikan residents also generally favor roaded recreation opportunities and roaded access to the rest of Revilla Island.

Some respondents requested that greater emphasis be placed on fish, and maintenance of old-growth habitat near their community for wildlife. The Chamber of Commerce indicated that the current management emphasis for wildlife and timber harvesting is adequate. Individuals who responded to the issues along with the Chamber agree that current management emphasis on subsistence is adequate and that timber harvest and road construction have a positive effect on subsistence opportunities. Many other respondents want the current timber sale program and the long-term contracts to continue, and many requested an increase in the allowable sale quantity (ASQ).

Individual Ketchikan respondents want less Wilderness as does the Chamber. The Ketchikan State Parks Advisory Board recommended that portions of existing Wilderness be made available for timber harvest in exchange for other Wilderness-like areas. The Chamber supports additional emphasis on timber and mining. However, the State Parks Advisory Board wants emphasis on tourism, wildlife, recreation and subsistence. Individuals commented that a balanced combination of timber, mining and other commodity industries with tourism, recreation and fishing would be most desirable.

Those offering oral or written testimony expressed considerable differences of opinion. The Ketchikan Chamber of Commerce, Alaska Women in Timber, and many individuals pointed out the importance of the timber industry to the economy of Southeast Alaska. They want a higher ASQ than currently exists and believe that roads created for logging can provide more recreation opportunities. The Tongass Conservation Society and many individuals do not want high-volume old-growth harvested, particularly on Cleveland Peninsula, Honker Divide, Salmon Bay, and Orchard Lake and Creek. They would like more emphasis on recreation and subsistence in these areas.

Direct, Indirect, and Cumulative Effects

Ketchikan would be primarily influenced by changes in recreation and tourism use, commercial fishing, timber processing, and recreation opportunities.

The timber industry would be subject to the largest amount of variation among the alternatives. Alternative 1 would likely result in the closure of the Ketchikan Pulp Company (KPC) Sawmill, the KPC Pulp Mill, and Seaborne Lumber. This would significantly reduce the employment level, tax base, and income level within the community. Alternatives 4 and 5 would likely result in the closure of the Pulp Mill and either Seaborne Lumber or one of KPC's sawmills if timber prices increase. If timber prices remain constant, Alternatives 4 and 5 would likely close the Pulp Mill, Seaborne Lumber, and one of KPC's sawmills. Alternatives 6 and 8 should supply enough timber to operate both sawmills at full capacity if prices increase, and enough timber for at least one shift if prices remain constant. Alternatives 6 and 8 should yield enough chipped wood for the pulp mill to operate at full capacity if KPC is able to purchase all the pulp grade logs from independent operators. Alternative 3 would provide enough timber supply to operate both the KPC sawmills and Seaborne Lumber operating at one shift. In addition, there would be enough timber supply to operate one of these mills at full capacity if timber prices increase. The alternative should provide enough chipped wood to operate the pulp mill at historical capacity; if timber prices increase, there would be enough chipped wood to operate the pulp mill at full capacity. Otherwise, higher grade logs would need to be run through the pulp mill to operate at full capacity. Alternatives 2, 7 and 9 should provide enough timber to operate the pulp mill and both sawmills at full capacity.

Commercial fisheries employment is not likely to be affected by forest management activities to any significant degree during the next ten years.

Recreation and tourism have become increasingly important to the economy of Ketchikan. The downtown dock has been expanded to accommodate additional cruise ships and a new waterfront development is under construction. Ketchikan is also the stop-over point for visitors traveling to Misty Fiords and Prince of Wales Island. Recreation and tourism use is projected to increase roughly to the same degree in all alternatives, benefiting retail trade in Ketchikan. However, since Alternatives 1, 4 and 5 could result in the closure of the Pulp Mill plus some or all of the sawmills, the resulting declines in timber employment could have a ripple effect and reduce retail trade and services employment. This would be especially true during September through May when recreation and tourism use is much lower.

The most important recreational area for Ketchikan residents include Cleveland Peninsula, Revilla Island, Gravina Island, and Misty Fiords. Alternative 1 maintains all of these areas in essentially their current condition. This would provide for Remote and Semi-Remote Recreational opportunities but would preclude road access for residents to the northern end of Revilla Island via Carrol River. Alternatives 2 and 9 would allow some timber harvest on Cleveland Peninsula and Revilla Island including a potential road connection out of town to the northern part of Revilla. Gravina Island and Misty Fiords would remain in their current condition. Alternative 3 would allow some timber harvesting on Cleveland Peninsula but avoid Union Bay. The visual quality would be maintained in Helm Bay. Some timber harvesting would be permitted on Revilla Island, but key recreation and wildlife areas would be avoided. Misty Fiords and Gravina Island would be maintained in the current condition. Alternative 4 would maintain Revilla Island, Gravina Island, and Misty Fiords in their current condition. Some timber harvesting would be permitted on Cleveland Peninsula but would be mitigated to maintain important recreation places. Alternatives 5 and 6 would maintain Revilla Island, Gravina and Misty Fiords in their current condition. Some timber harvesting would be permitted on Cleveland Peninsula but would be mitigated to maintain important wildlife and recreation places. Alternative 7 would allow intensive timber harvest on Cleveland Peninsula, Gravina, and Revilla Island. Misty Fiords would be maintained in its current condition. Alternative 8 would allow intensive timber harvest while important wildlife areas on Cleveland Peninsula, Gravina, and Revilla Island. Misty Fiords would be maintained in its current condition.

The Socio-economic Panel's assessment for Ketchikan used in evaluating the effects described above resulted in the following estimated effects on community indicators:

KETCHIKAN	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇓/⇔	⇓	⇓	⇓	⇓/⇔	⇑	⇓/⇔	⇑/⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇓	⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇑/⇔	⇑/⇔	⇑	⇑	⇑/⇔	⇓	⇓/⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇓	⇔	⇔	⇓/⇔	⇑/⇓	⇑/⇔	⇓/⇔	⇔	⇓/⇔
Community stability	⇓	⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇔	⇓/⇔	⇔	⇔
Quality of life	⇓	⇔	⇓/⇔	⇓/⇔	⇑/⇓	⇔	⇓	⇔	⇓/⇔
Recreation opportunities	⇑	⇑/⇔	⇑	⇑/⇔	⇑	⇑/⇔	⇓	⇔	⇓/⇔
Access to traditional lifestyle	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔

Table 3-135 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Ketchikan's hunting use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Ketchikan hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Ketchikan residents. Alternatives 2, 7 and 9 slightly exceed 10 percent of habitat capability and may have future inadequate habitat capability for the total deer hunted within the WAA's. If a restriction would be necessary, sport hunting by Ketchikan residents would be restricted before subsistence hunting by rural residents is restricted.

Table 3-135. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Ketchikan residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Ketchikan Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1421	121	234	2442	2184	1579	1864	1850	2048	1958	1278	1697	1423
1422	99	343	3617	2556	2291	2447	2501	2535	2403	1940	2381	2210
613	97	104	1405	1398	1050	1204	1196	1224	1108	964	1172	1003
101	87	100	1513	1511	1511	1511	1511	1511	1511	1026	1313	1511
1530	58	152	1427	1427	1067	1427	1427	1427	1427	1003	1130	1015
406	55	84	2409	2316	1761	1978	1999	1999	1788	1582	1875	1649
1529	55	179	2051	1760	1395	1552	1564	1601	1495	1270	1494	1311
612	52	57	1802	1801	1238	1426	1482	1482	1270	1153	1390	1140
1319	50	299	2364	2364	1536	2364	2364	2364	2364	1374	1757	1373
407	49	46	950	933	633	736	766	766	654	663	748	626
1420	49	107	790	790	534	790	790	790	790	516	571	517
1214	46	82	1405	1345	916	1138	1113	1178	1067	865	1067	869
1003	46	142	2639	1970	1565	1865	1771	1771	1638	1439	1859	1439
509	43	57	1214	1201	1008	1099	1086	1086	1010	852	1032	974
1211	40	38	1768	1686	1312	1453	1481	1481	1345	1221	1419	1208
408	38	36	361	361	358	361	361	361	361	358	358	358
1323	38	126	1654	1625	1341	1441	1470	1488	1396	1239	1408	1220
1315	32	150	2076	1907	1499	1606	1696	1717	1575	1412	1569	1402
510	32	41	1860	1838	1334	1479	1565	1565	1383	951	1296	1113
3315	30	127	1284	1240	924	1167	1062	1062	943	759	1151	884
1106	28	46	388	388	388	388	388	388	388	253	380	253
Total	1145	2550	35419	32601	25240	29296	29444	29844	27874	22118	27067	23498

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
% Change in Habitat Capability From 1995:	-8.0	-28.7	-17.3	-16.9	-15.7	-21.3	-37.6	-23.6	-33.7
Ketchikan Harvest % of 2095 Capability:	3.5	4.5	3.9	3.9	3.8	4.1	5.2	4.2	4.9
Total Harvest % of 2095 Capability:	7.8	10.1	8.7	8.7	8.5	9.1	11.5	9.4	10.9

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

Ketchikan is not classified as a subsistence community, however many residents use the surrounding Tongass for hunting and fishing.

WAA's 1530, 1319, 1420, 408 and 1106 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. Alternative 1 is unlikely to have direct impacts on Ketchikan's hunting use with little timber harvest activity occurring. In Alternatives 2 - 9 the majority of the area used by Ketchikan hunters is within development LUD's and would likely be impacted by timber harvest activity. Alternatives 3, 6, and 8 allocate Old Growth Habitat LUD's which would maintain wildlife habitat in some of Ketchikan's use areas, including the Cleveland Peninsula. Alternatives 4 and 5 with a longer rotation would likely maintain the habitat within all of Ketchikan's use areas over time.

The displacement of hunters that may occur in Alternative 2 - 9 with continued or increased timber harvesting would likely increase competition for deer. The impact of increased competition may affect Ketchikan hunters because

Ketchikan is not a rural community, and sport hunting would be restricted before subsistence hunting. An increase in access opportunities may create lower cost access for Ketchikan hunters.

Klawock

Klawock is located on the west coast of Prince of Wales Island, across from Klawock Island, approximately 56 air miles from Ketchikan. It is connected by road to Craig and to other communities on the Prince of Wales Island road system. Its population is 759, 54 percent of whom are Alaska Native (ADCRA 1995).

The mouth of the Klawock River, where the village of Klawock is now located, has been the site of Tlingit occupation for at least the past 600 years. According to oral history, some members of the Kuiu *kwaan* of Kuiu Island moved to Klawock as well (ADF&G 1994). Klawock is now the center of the Tlingit population on west Prince of Wales Island.

The history of Klawock is closely tied to the fishing industry. A trading post and salmon saltery were established in 1868, and the first cannery in Alaska was built here by a San Francisco firm in 1878. A hatchery for red salmon operated at Klawock Lake between 1897 and 1917 (ADCRA 1994). In 1929, Klawock incorporated as a first class city. The community has a local Fish and Game Advisory Committee (ADF&G 1994).

Economy

The community's cash economy has been heavily dependent on commercial fishing and canning and, as a result, has fluctuated with the economic conditions of the area's fisheries. The years from 1921 to 1940 were the "boom period" of the commercial fishing industry and Klawock became the site of the first Native-owned canneries in the Prince of Wales Archipelago. In the 1980s, Klawock-Heenya, the Alaska Native Claims Settlement Act (ANCSA) village corporation, entered the timber market with harvest on corporation lands in the vicinity of Klawock, and has constructed docking and log trans-shipment facilities near the city. The primary use of these facilities has been the export of timber in the round from Native-owned land to Japan (ADF&G 1994).

Timber and fishing are chief economic factors, however it is becoming more of a retail and service center, and maintains a growing recreation-based industry including lodges and fishing guides. A new mall with a supermarket, restaurant and liquor store was recently built, offering new retail jobs. The 1989 median household income was $39,583 (ADCRA 1995). Unemployment in 1994 in this census area was 12.5 percent, compared to 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the mean household subsistence harvest in Klawock was 830 edible pounds (per capita harvest information was unavailable). About 96 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho and sockeye salmon, halibut, dungeness crab, deer, berries, and wood (TRUCS 1989).

Based on edible pounds harvested, salmon at 32 percent, finfish other than salmon at 29 percent and deer at 19 percent are the most important subsistence resources for Klawock households. Klawock hunters travel an average of 35 miles to their most reliable deer hunting areas (Kruse and Frazier 1988). Subsistence harvest methods within the community of Klawock have been changing since the road connection with Hollis was made in the 1960s. Prior to that time, subsistence harvest was mostly tied to boating activities. Since road access to the rest of the island has been available to the residents of Klawock, there has been a shift from using boats to harvest subsistence materials to using trucks and cars (Ellanna and Sherrod 1987, *in* Control Lake DEIS, p. 3-164).

Appendix C provides detailed maps regarding the areas that Klawock households have ever used to hunt deer. Summarizing, the majority of Klawock households hunt deer in Wildlife Analysis Areas (WAA's) 1318, and 1422. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 1318 (74 deer), 1422 (35 deer), and 1323 (30 deer) (ADF&G 1994). These WAA's are 18, 66, and 9 percent accessible by existing roads.

Opinions

A number of Klawock residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Klawock respondents to the issues indicated a desire to see more emphasis placed on managing for scenic resources, recreation, and wildlife. The Klawock Cooperative Association recommended that additional management emphasis be placed on subsistence. Individual respondents and the Association want the current timber sale program reduced and the long-term contracts terminated. Individuals want a balance between timber, mining, tourism, recreation and fishing.

Those offering oral or written comments expressed considerably different opinions. Some individuals want the current timber sale program increased both for jobs and the continued viability of small business. The Klawock Cooperative Association indicated that a timber sale program of more than 400 million board feet would be bad for subsistence. Of special concern are roads which increase competition for deer. Klawock Tribal Elders are opposed to any timber harvesting on Prince of Wales Island stating that the land belongs to the Klawock Tlingit people. The Alaska Native Brotherhood does not want log transfer sites built at Kelly Cove, Nail Point or Cape Elika.

Direct, Indirect, and Cumulative Effects

Klawock is a traditional native community. Subsistence use, retail services, and timber employment are most likely to affect the community.

Timber-related employment is a major employment sector in Klawock. The Viking Lumber sawmill is located in Klawock. There would likely not be sufficient volume to keep this mill open in Alternatives 1, 4 or 5. This would result in the loss of jobs in Klawock. In addition, Alternatives 1, 4, 5, and 6 essentially eliminate all intensive timber harvesting on the north end of the island. Although some individual tree selection opportunities would be available, it amounts to less than 2 MMBF in any alternative and would most likely be purchased by very small operators for products such as music wood or cedar shakes. Residents who want to stay associated with the logging industry would either have to relocate or travel to remote logging camps elsewhere during the week for employment.

Retail trade and services have become increasingly important to the economy of Klawock. A new shopping center has recently opened and many communities on northern Prince Wales as well as recreation users and tourists do their shopping there. Recreation use is projected to increase roughly to the same degree in all alternatives, benefiting retail trade in Klawock. However since Alternatives 1, 4 and 5 essentially halt timber harvest on north Prince of Wales Island, the resulting declines in timber employment could have a ripple effect and reduce retail trade and services employment. This would be especially true during September through May when recreation and tourism use is much lower.

The Socio-economic Panel's assessment for Klawock used in evaluating the effects described above resulted in the following estimated effects on community indicators:

KLAWOCK	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇑/⇔	⇓/⇔	⇓	⇓	⇓/⇔	⇑	⇔	⇑/⇔
Resource jobs - comm. fishing	⇑	⇓/⇔	⇑/⇔	⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓	⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇓/⇔	⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇓	⇓/⇔	⇓/⇔
Community stability	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇓	⇔	⇓/⇔
Quality of life	⇑	⇓/⇔	⇓/⇔	⇔	⇔	⇔	⇓	⇓/⇔	⇓
Recreation opportunities	⇑	⇑	⇑/⇓	⇑	⇑	⇑	⇓	⇓/⇔	⇓
Access to traditional lifestyle	⇑	⇓	⇓	⇓/⇔	⇓	⇓/⇔	⇓	⇓	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 75 percent of the total edible pounds of subsistence resources harvested by Klawock households (Kruse and Frazier 1988).

Table 3-136 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Klawock's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Klawock hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Klawock residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability and all alternatives may have future inadequate habitat capability for the total deer hunted. At some point, a restriction in hunting may be necessary, especially for Alternatives 2, 7 and 9 which could be close to 20 percent of deer habitat capability being harvested in the year 2095. Deer account for 19 percent of the total edible pounds of subsistence resources harvested by Klawock households (Kruse and Frazier 1988).

Table 3-136. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Klawock residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
	Klawock	All	Habitat									
WAA*	Residents	Hunters	Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1318	74	323	1213	1213	782	1213	1213	1213	1213	784	838	764
1422	35	361	3617	2556	2291	2447	2501	2535	2403	1940	2381	2210
1323	30	126	1654	1625	1341	1441	1470	1488	1396	1239	1408	1220
1319	27	302	2364	2364	1536	2364	2364	2364	2364	1374	1757	1373
1421	19	242	2442	2184	1579	1864	1850	2048	1958	1278	1697	1423
1529	14	180	2051	1760	1395	1552	1564	1601	1495	1270	1494	1311
Total	199	1534	13341	11702	8924	10881	10962	11249	10829	7885	9575	8301
% Change in Habitat Capability From 1995:				-12.3	-33.1	-18.4	-17.8	-15.7	-18.8	-40.9	-28.2	-37.8
Kalwock Harvest % of 2095 Capability:				1.7	2.2	1.8	1.8	1.8	1.8	2.5	2.1	2.4
Total Harvest % of 2095 Capability:				13.1	17.2	14.1	14.0	13.6	14.2	19.5	16.0	18.5

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

WAA's 1318, and 1319 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. With little timber harvest activity, Alternative 1 would have the least effect on Klawock's subsistence uses. Alternatives 2 - 9 would likely have a direct effect on Klawock's subsistence resources with much of Klawock's subsistence use areas within a development LUD. This LUD prescription indicates continued and possibly increased timber harvest activity. Alternatives 3, 6, and 8 maintain some specific areas with Old Growth Habitat LUD's, but these cover a small portion of Klawock's use area. Alternatives 4 and 5 have longer rotations which would provide Klawock with a higher level of older forest within the development LUD's they use. Although subsistence resources may be best provided for in Alternatives 1, 4, and 5, some of them may result in loss of jobs and therefore community emigration.

Alternatives 3, 6, and 8 may indirectly impact Klawock by displacing hunters from other communities with timber harvest activities outside of the Old Growth Habitat LUD's. Alternatives 2, 7, and 9 would likely increase access opportunities for Klawock hunters. At the same time, these roads may also bring in greater competition from other communities taking advantage of the increased access.

Metlakatla

Metlakatla is located on Annette Island in southern Southeast Alaska, 15 miles south of Ketchikan. Its population of 1,600 includes 84 percent Alaska Native (ADCRA 1995).

Although Metlakatla is believed to have been occupied at one time by Tlingit Indians, it was settled in 1887 by Church of England minister William Duncan and about 830 Tsimshian followers from northern British Columbia. In 1891, an Act of Congress declared Annette Island an Indian Reservation (the Annette Island Reserve), the only one in Alaska. This action set aside the reservation for the exclusive use and occupancy by "Metlakatla Indians and such other Natives of Alaska who might join them" (ADF&G 1994).

Metlakatla is a traditional Tsimshian community with an active economy and subsistence lifestyle. The community was not part of ANCSA, rather, the 86,000-acre Island reservation and surrounding 3,000 feet of coastal waters are not subject to State jurisdiction. It regulates commercial fishing in these waters, and operates its own tribal court system (ADCRA 1994). The community participates in regional fish and game management issues (ADF&G 1994).

Economy

The community of Metlakatla has prospered in part due to its successful involvement in commercial fishing and lumber industries. Metlakatla's economy is structured around fishing and wood products industries, and because it is an Indian Reservation, there can be no local tax base (ADCRA 1994). The first developments included a community retail outlet, sawmill, and salmon cannery. KPC owns the primary sawmill in Metlakatla. Subsequent developments included continuous upgrading of the cannery, fish traps, fishing fleet, sawmill, hydroelectric and diesel generation plants, and constructing a cold storage operation. In 1977, the Tamgass Creek Hatchery opened. The community-owned and operated salmon cannery, including an egg house, is the center of activity from mid-June through November each year. The Annette Island Packing Company contracted with a Japanese firm to sell salmon eggs and herring roe to Japan (ADF&G 1994).

Timber and fishing are key economic sectors, however the largest employer is the Metlakatla Indian Community. Its 1989 median household income was $37,143 (ADCRA 1995). Unemployment is this census area is 12.5 percent, compared to 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita household subsistence harvest in Metlakatla was 71 edible pounds. Seventy-seven percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho and chinook salmon, halibut, deer, clams, dungeness crab, and berries (TRUCS 1989).

Based on edible pounds harvested, salmon at 28 percent, finfish other than salmon at 23 percent, invertebrates at 23 percent and deer at 15 percent are the most important subsistence resources for Metlakatla households. Metlakatla hunters travel an average of 12 miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Metlakatla households have ever used to hunt deer. Summarizing, the majority of Metlakatla households hunt deer in Wildlife Analysis Areas (WAA's) 1210, 303, and 202. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 303 (8 deer), 1210 (3 deer), and 1422 (2 deer) (ADF&G 1994). WAA's 303 and 1210 are virtually roadless and WAA 1422 is 66 percent accessible by existing roads.

Opinions

A number of Metlakatla residents provided oral and/or written comments on the TLMP revision DEIS or Supplement. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

The Annette Natural Resources Center wants subsistence emphasized. Others indicated that both timber harvesting and subsistence are important to the community and can exist together. Concern about the impacts to small mills if harvest is reduced was expressed. Many expressed concerns about their own employment in the timber industry.

Direct, Indirect, and Cumulative Effects

Metlakatla could be affected primarily by changes in recreation and tourism use, commercial fishing, timber processing, and subsistence opportunities.

The timber industry will be subject to the largest amount of variation among the alternatives. Alternative 1 would likely result in the closure of the KPC Sawmill in Metlakatla. This could significantly reduce the employment level, and income level within the community. Alternatives 4 and 5 would likely result in the closure of one of KPC's sawmills if timber prices increase. Alternatives 6 and 8 should supply enough timber to operate sawmills at full capacity if prices increase, and enough timber for at least one shift if prices remain constant. Alternative 3 would provide enough timber supply to operate both the KPC sawmills at one shift. In addition, there would be enough timber supply to operate one of these mills at full capacity if timber prices increase. Alternatives 2, 7 and 9 should provide enough timber to operate the sawmills at full capacity.

Commercial fisheries employment is not likely to be affected by forest management activities to any significant degree during the next ten years.

The Socio-economic Panel's assessment for Metlakatla used in evaluating the effects described above resulted in the following estimated effects on community indicators:

METLAKATLA	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇔	⇓	⇓/⇔	⇓/⇔	⇔	⇑	⇔	⇑/⇔
Resource jobs - comm. fishing	⇑/⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇓	⇔	⇔	⇑/⇔	⇑	⇔	⇑/⇓	⇔	⇔
Community stability	⇓	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇔
Quality of life	⇓	⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇔	⇔
Recreation opportunities	⇑	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Access to traditional lifestyle	⇑	⇓/⇔	⇔	⇔	⇔	⇔	⇓	⇓/⇔	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 75 percent of the total edible pounds of subsistence resources harvest by Metlakatla households (Kruse and Frazier 1988).

Table 3-137 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Metlakatla's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Metlakatla hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of

Table 3-137. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Metlakatla residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Metlakatla Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
303	8	8	1592	1590	1590	1590	1590	1590	1590	1359	1589	1590
1210	3	19	2242	2240	1653	1859	1917	1917	1702	1233	1699	1523
1422	2	343	3617	2556	2291	2447	2501	2535	2403	1940	2381	2210
Total	13	370	7451	6386	5534	5896	6008	6042	5695	4532	5669	5323
% Change in Habitat Capability From 1995:				-14.3	-25.7	-20.9	-19.4	-18.9	-23.6	-39.2	-23.9	-28.6
Metlakatla Harvest % of 2095 Capability:				0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2
Total Harvest % of 2095 Capability:				5.8	6.7	6.3	6.2	6.1	6.5	8.2	6.5	7.0

approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Metlakatla residents, as well as for all deer hunted within the WAA's. Deer account for 15 percent of the total edible pounds of subsistence resources harvested by Metlakatla households (Kruse and Frazier 1988).

Annette Island is not National Forest system land, so subsistence resources used by Metlakatla households there will not be affected by any of the alternatives. With little timber harvest activity, Alternative 1 would provide the least affect on Metlakatla's subsistence uses. Alternatives 2, 3, 4, 5, and 6 allocate much of Metlakatla's subsistence use areas to recreation LUD's. It is unlikely that these alternatives will directly impact Metlakatla's use of the area. Alternative 8 allocates much of Metlakatla's subsistence use areas to Old Growth Habitat LUD's, providing habitat which will likely assure subsistence uses. Alternatives 7 and 9 allocate much of Metlakatla's subsistence use areas to development LUD's. This will likely impact subsistence use through timber harvest activity.

Meyers Chuck

Meyers Chuck is a small fishing village with a seasonal population of 30-40 people located along Clarence Strait, on the northwest tip of Cleveland Peninsula, 40 miles northwest of Ketchikan. Almost 11 percent of the population is Alaska Native (ADCRA 1995).

Beginning as a protected anchorage for fishing vessels, Meyers Chuck grew with the building of a cannery in Union Bay in 1916. Postal service began in 1922. Fishing and fish processing, and support services sustained the community until the mid-1900s. Fishing and fish processing are still the basic source of income, however some residents have sought employment in Ketchikan or on Prince of Wales Island. Recently, the population has begun to grow with fishers, retirees, and a few vacationers locating there (ADF&G 1994).

Economy

Fishing is the main economic sector of Meyers Chuck. The 1989 median household income was $16,250. The 1994 unemployment rate in this census area was 12.5, compared to 8.2 in all of Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita household subsistence harvest in Meyers Chuck was 414 edible pounds. All households harvested some subsistence resource as Myers Chuck residents depend on subsistence activities to supplement the relatively low cash economy. Most commonly used (by over 50% of households) were coho, chinook, and pink salmon, halibut, rockfish, deer, dungeness crab, clams and cockles, shrimp, berries, and wood (TRUCS 1989).

Based on edible pounds harvested, finfish other than salmon at 42 percent and salmon at 25 percent are the most important subsistence resources for Meyers Chuck households. Deer comprise only five percent of the total edible pounds harvested. Meyers Chuck hunters travel an average of 12 miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Meyers Chuck households have ever used to hunt deer. Summarizing, the majority of Meyers Chuck households hunt deer in Wildlife Analysis Areas (WAA's) 613, 614, and 1817. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 614 (5 deer), 613 (3 deer), and 1531 (3 deer) (ADF&G 1994). WAA's 614 and 613 are virtually roadless and WAA 1531 is 74 percent accessible by existing roads.

Opinions

A number of Meyers Chuck residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion. However, a majority of residents endorsed the comments of the Meyers Chuck Community Association.

Meyers Chuck residents and the Meyers Chuck Community Association do not want roads connected to their community nor do they want logging within 3,000 feet of Meyers Chuck watershed. They want the Meyers Chuck peninsula and the Union Bay/Bear Creek valley to be a primitive recreation area and prefer that log transfer sites remain on the Behm Canal side of Cleveland Peninsula. Some residents do not want timber harvest to occur anywhere on Cleveland Peninsula.

Direct, Indirect, and Cumulative Effects

Because Myers Chuck is located on Cleveland Peninsula, the primary effect will be from how the Cleveland Peninsula is managed for timber harvest. This area has been available for timber harvest in the current land management plan (TLMP, 1979, as amended in 1985-1986, 1991), but has not yet been entered for intensive harvest.

Alternative 1 maintains all of the Cleveland in its current state. Alternatives 2 and 9 would allow timber harvest on Cleveland Peninsula; however, these alternatives include standards and guidelines which would reduce the size and shape of harvest units in Helm Bay and Union Bay to mitigate their visual impact. Small areas of important wildlife habitat would be allocated to the Old Growth Habitat LUD. Alternative 3 would allow some timber harvesting on Cleveland Peninsula but avoid Union Bay. Visual quality would be maintained in Helm Bay. Alternative 4 would permit some timber harvest on Cleveland Peninsula, but it would be mitigated to maintain important recreation places. Alternatives 5 and 6 would permit some timber harvesting on Cleveland Peninsula, but it would be mitigated to maintain important wildlife and recreation places. Alternative 7 would allow intensive timber harvest on Cleveland Peninsula. Alternative 8 would allow intensive timber harvest except for areas allocated to the Old Growth Habitat LUD for wildlife purposes on Cleveland Peninsula. It should also be noted that since Alternatives 4, 5 and 6 essentially eliminate timber harvest on north Prince of Wales, there could be increased pressure to harvest timber on Cleveland during the first decade of the plan. In the past, intensive timber harvest on Prince of Wales has allowed the Cleveland to remain un-harvested, despite being allocated to LUD's which permit timber harvest.

The Socio-economic Panel's assessment for Meyers Chuck used in evaluating the effects described above resulted in the following estimated effects on community indicators:

MEYERS CHUCK	**ALTERNATIVE**								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Resource jobs - timber	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇑/⇔
Resource jobs - comm. fishing	⇑	⇓/⇔	⇔	⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇓/⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇓	⇓
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇑/⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇔	⇓/⇔
Community stability	⇑/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔
Quality of life	⇑	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓	⇓/⇔	⇓
Recreation opportunities	⇑	⇓	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓	⇓/⇔	⇓
Access to traditional lifestyle	⇑	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓	⇓/⇔	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in alternatives 2-9 (see the fish section of this chapter). These resources account for 80 percent of the total edible pounds of subsistence resources harvest by Meyers Chuck households (Kruse and Frazier 1988).

Table 3-138 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Meyers Chuck's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Meyers Chuck hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Meyers Chuck residents, as well as for all deer hunted within the WAA's. Deer account for five percent of the total edible pounds of subsistence resources harvested by Meyers Chuck households (Kruse and Frazier 1988).

Table 3-138. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Meyers Chuck residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Meyers Chk Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
614	5	13	1592	441	310	334	365	365	315	306	324	297
613	3	104	2242	1398	1050	1204	1196	1224	1108	964	1172	1003
1531	3	33	3617	1753	1452	1573	1604	1604	1504	1193	1497	1193
1526	2	56		2261	2150	2204	2204	2217	2188	2126	2189	2127
Total	13	206	7451	5853	4962	5315	5369	5410	5115	4589	5182	4620
% Change in Habitat Capability From 1995:				-21.4	-33.4	-28.7	-27.9	-27.4	-31.4	-38.4	-30.5	-38.0
Meyers Chuck Harvest % of 2095 Capability:				0.2	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.3
Total Harvest % of 2095 Capability:				3.5	4.2	3.9	3.8	3.8	4.0	4.5	4.0	4.5

With little timber harvest activity, Alternative 1 would provide the greatest likelihood for continuation of Meyers Chuck's subsistence uses. Alternatives 3, 5, 6, and 8 allocate much of Meyers Chuck's subsistence use areas to Old Growth Habitat LUD's, providing for the maintenance of subsistence uses. Alternatives 2, 7, and 9 allocate much of Meyers Chuck's subsistence use areas to development LUD's. This will likely impact subsistence use through timber harvest activity. Alternative 2 - 9 also designate a minerals development LUD within Meyers Chuck's use area. Depending on the level of development that may occur there, subsistence resources may be impacted. Alternatives with continued or increased timber harvest activity may indirectly impact Meyers Chuck's subsistence use through increased access opportunities.

Naukati Bay

Naukati Bay is a logging camp located on the northwest coast of Prince of Wales Island. The area covers 6.5 square miles, and has a population of 262, with only 1.1 percent Alaska Native. The U.S. Coast and Geodetic Survey named the area "Naukatee Nay" in 1904 after the local Indian name (ADCRA 1995).

Naukati was first developed as a logging camp, but in 1991 an area approximately a mile from the camp was opened by the State Department of Natural Resources as a land disposal site for homesteaders (ADCRA 1995). This is the reason that Naukati, while still considered a logging camp by most interpretations, is included in this TLMP analysis along with the other "permanent" Southeast communities. Other logging camps, considered temporary by the Forest Service, are not included in this community-by-community analysis.

Economy

Sawmills and related logging and lumber services are the sole income source for Naukati residents, and as with other logging camps, the bulk of the employment is seasonal. The Census showed the 1989 median household income as $43,333. Unemployment in 1994 in this census area was 12.5 percent, compared to 8.2 percent for all of Southeast Region *(Alaska Economic Trends* 4:1995).

Subsistence Use

Naukati was not surveyed by the Tongass Resource Use Cooperative Survey (TRUCS), therefore there is no baseline subsistence data for this community. Similarly, Alaska Department of Fish and Game Subsistence Division has not included Naukati in its *Subsistence Resource Use Patterns* publication. Similarly, as the basis for the maps shown in Appendix C are the ADF&G hunter survey information, and Naukati is not included in this source either, there is no subsistence map for Naukati.

Direct, Indirect, and Cumulative Effects

Naukati is primarily a logging community and as such will be directly affected by the amount of logging opportunities on north Prince of Wales Island.

Alternatives 1, 4, 5 and 6 would essentially eliminate all intensive timber harvesting on the north end of the Island. Although some individual tree selection opportunities will be available, it amounts to less than 2 MMBF in any alternative, and would most likely be purchased by very small operators for products such as music wood or cedar shakes. The result of the lack of logging opportunities could result in disruption of the community stability. Residents who want to stay in the logging industry would either have to relocate or travel to remote logging camps elsewhere during the week for employment. If these individuals choose to relocate, the loss of their income would affect others in the community.

Alternatives 2, 3, 7, 8, and 9 would continue logging opportunities on the north end of the island. This would allow those individuals associated with the logging industry to maintain their existing lifestyle within the community.

The Socio-economic Panel's assessment for Naukati used in evaluating the effects described above resulted in the following estimated effects on community indicators:

NAUKATI	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇑/⇔	⇑/⇓	⇓	⇓/⇔	⇓/⇔	⇑	⇑/⇔	⇑/⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇓	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇔
Community stability	⇓	⇔	⇔	⇓/⇔	⇓/⇔	⇔	⇑/⇔	⇔	⇑/⇔
Quality of life	⇓	⇔	⇔	⇓/⇔	⇓/⇔	⇔	⇑	⇔	⇑/⇔
Recreation opportunities	⇑/⇔	⇔	⇑/⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇔	⇓/⇔
Access to traditional lifestyle	⇓	⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇔	⇔	⇔	⇔

Table 3-139 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Naukati's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Naukati hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Naukati residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability and all alternatives may have future inadequate habitat capability for the total deer hunted. At some point, a restriction in hunting may be necessary

Table 3-139. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Naukati residents obtain approximately 75% of their average annual deer harvest.

WAA*	Average Deer Harvest From 1987-1994: Naukati Residents	Average Deer Harvest From 1987-1994: All Hunters	1995 Deer Habitat Capability	Deer Habitat Capability by Alternative at 2095: Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1422	22	343	3617	2556	2291	2447	2501	2535	2403	1940	2381	2210
1323	3	126	1654	1625	1341	1441	1470	1488	1396	1239	1408	1220
Total	25	469	5271	4181	3632	3888	3970	4023	3799	3179	3789	3430
% Change in Habitat Capability From 1995:				-20.7	-31.1	-26.2	-24.7	-23.7	-27.9	-39.7	-28.1	-34.9
Naukati Harvest % of 2095 Capability:				0.6	0.7	0.6	0.6	0.6	0.7	0.8	0.7	0.7
Total Harvest % of 2095 Capability:				11.2	12.9	12.1	11.8	11.7	12.3	14.8	12.4	13.7

With little timber harvest activity, Alternative 1 would provide the greatest maintenance of Naukati Bay's subsistence uses. Alternatives 2 - 9 allocate much of Naukati Bay's use to development LUD's, with timber harvest activity likely to impact subsistence use. Alternatives 4 and 5 with longer rotations would likely decrease the impacts of timber harvesting on Naukati Bay's subsistence resources. Although subsistence resources may be best provided for in Alternatives 1, 4, and 5, they may result in loss of jobs and therefore community emigration.

Pelican

Pelican is a fishing village along Lisianski Inlet on the northwest corner of Chichagof Island 70 air miles north of Sitka and 70 air miles west of Juneau. Part of the community is built on pilings over the tideland. A boardwalk serves as the town's main thoroughfare due to the lack of flat land. Pelican has a population of 240, with almost 30 percent Alaska Native (ADCRA 1995).

Prior to its settlement in 1938, the area had been used as a safe harbor by fishermen and as a hunting, fishing, trapping and gathering site by Hoonah Tlingit groups, who claimed lands on either side of Cross Sound (ADF&G 1994).

Pelican was incorporated as a second class city in 1943. Pelican employs a full-time city manager and is governed by a mayor and city council. The community has a local Fish and Game Advisory Committee. The Native community, largely Tlingit, comprises about one third of the community and is represented by a local Tlingit and Haida Community Council. No Native land allotments or withdrawals occur in the immediate vicinity of Pelican. Pelican is accessible by the Alaska ferry system as well as by float plane from Juneau or Sitka (ADF&G 1994).

Economy

Pelican's economy expanded rapidly during the 1940-1960 period. However, with the decline of commercial fish stocks in the late 1950s and 1960s, the community's fishing economy suffered. The sawmill closed in 1957 and the population began declining until 1970. From 1970 to the present, the economy rebounded and Pelican experienced steady population and economic growth, largely attributable to the expansion of seafood processing activities. In the 1980s the State began disposing of land parcels totaling approximately 150 acres under the State Land Lottery Program (ADF&G 1994).

Pelican Seafoods has been the primary year-round employer, however, in February 1996 it announced that it would not be operational in 1996. The plant provides seasonal employment for 100 people in the town of just over 200, draws some 350 trollers and longliners to the town docks, and generates sales and raw fish tax revenues that cover close to half the budget for this city. Local business are feeling the effects of the closure already (*The Paper*, v.1, no. 15, 1996) . The 1989 median household income was $27,083 (ADCRA 1995). Unemployment in 1994 in this census area was 10.6 percent, compared to 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita household subsistence harvest in Pelican was 355 edible pounds. More than 91 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were chinook and coho salmon, cod, halibut, roe on kelp, rockfish, deer, clams, crabs, shrimp, berries, and wood (TRUCS 1989).

Residents harvest deer, bears, waterfowl, furbearers, salmon, marine fish, shellfish, herring eggs, plants, and berries. Based on edible pounds harvested, finfish other than salmon at 33 percent, deer at 30 percent and salmon at 17 percent are the most important subsistence resources for Pelican households. Pelican hunters travel an average of 10 miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 3419 (57 deer) and 3418 (44 deer) (ADF&G 1994). These WAA's are virtually roadless.

Opinions

A number of Pelican residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Pelican residents who responded to the issues requested that additional emphasis be placed on scenic resources along the Alaska Marine Highway routes, roads, streams and around their community. These individuals also requested that more emphasis be placed on recreation, fish, wildlife, and subsistence. The City of Pelican wants the current timber sale program reduced and the long-term contracts terminated. The City does not want additional roads, log transfer facilities or to be connected to existing roads. However, Pelican respondents were split in their opinion regarding road development with half wanting a reduction in developments and half wanting a mix of road development with other Forest uses. Individual Pelican respondents favored maintaining current management emphasis for mineral exploration and development while the City opposed emphasizing mineral exploration and development. Individual respondents want management to emphasize tourism, wildlife, recreation and subsistence economic sectors. They do not want timber harvest in Hoonah Sound south of Lisianski Inlet.

Direct, Indirect, and Cumulative Effects

Pelican is primarily a commercial fishing town. Pelican Seafoods, the primary employer, recently announced its closure. This will likely have an adverse affect on community stability. Commercial fishing and subsistence use should become increasingly important to the community due to the closure of the processing plant.

Commercial fishing is not expected to be significantly affected by Forest Service activities during the next ten years.

The Socio-economic Panel's assessment for Pelican used in evaluating the effects described above resulted in the following estimated effects on community indicators:

PELICAN	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Community stability	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Quality of life	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Recreation opportunities	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Access to traditional lifestyle	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 63 percent of the total edible pounds of subsistence resources harvest by Pelican households (Kruse and Frazier 1988).

Table 3-140 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Pelican's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Pelican hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Pelican residents, as well as for all deer hunted within the WAA's. Deer account for 30 percent of the total edible pounds of subsistence resources harvested by Pelican households (Kruse and Frazier 1988).

Table 3-140. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Pelican residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer Habitat	Deer Habitat Capability by Alternative at 2095								
WAA*	Pelican Residents	All Hunters	Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
3419	57	81	397	397	397	397	397	397	397	397	397	376
3418	44	107	1744	1744	1744	1744	1744	1744	1744	1744	1744	1611
3417	30	222	2644	2643	2643	2643	2643	2643	2643	2643	2643	2624
Total	131	410	4785	4784	4784	4784	4784	4784	4784	4784	4784	4611
% Change in Habitat Capability From 1995:				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.6
Pelican Harvest % of 2095 Capability:				2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.8
Total Harvest % of 2095 Capability:				8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.9

In terms of subsistence use, Lisianski Inlet, Icy Strait, northwest Chichagof, and Yakobi Island are the most important to Pelican. These areas are legislatively withdrawn from timber harvest as either Wilderness or LUD II or allocated to the Semi-Remote Recreation LUD in all alternatives except 9. Alternative 9 allows timber harvest in the non-legislated areas of Lisianski Inlet and Strait, although opportunities are very limited and no timber harvest is scheduled. Therefore, it is unlikely that subsistence use in Pelican will be directly affected by any of the alternatives.

Indirectly, it is unlikely that Pelican will be affected by increased competition or access because of the limited area open for development. The current limited access is unlikely to draw many additional hunters into the area due to displacement.

Petersburg and Kupreanof

Petersburg is located on the northern tip of Mitkof Island across Wrangell Narrows from Kupreanof Island. It lies midway between Juneau and Ketchikan, about 120 miles from either community. Its population is 3,419, with 10.4 percent Alaska Native (ADCRA 1995). The community of Kupreanof is located less than one mile from Petersburg, on Kupreanof Island. This settlement is economically tied to Petersburg, where most residents find employment, purchase goods, and attend school (ADF&G 1994).

Prior to Petersburg's development by homesteaders and fishermen at the turn of this century, Tlingit use of the area occurred at many small settlements (ADF&G 1994). The community of Petersburg was founded by Norwegian Peter Buschmann in 1899 and incorporated in 1906. More Norwegians followed and settled into a Scandinavian-style community. Petersburg has a local Fish and Game Advisory Committee, which takes an active interest in resource management issues (ADF&G 1994).

Economy

The town of Petersburg grew up around the Icy Strait Packing Company, on the northwest shore of Mitkof Island, started by Peter Buschmann in 1900. Along with the evolution of the commercial fishing industry, in which Petersburg has always been a leader in Southeast Alaska, a larger Tlingit community developed in the expanding town. This Indian community has been a permanent and stable component of the town throughout its development (ADF&G 1994).

The Petersburg area was heavily used by fur farmers until the late 1960s. For about five years in the early 1930s, a gold mine operated on Woewodski Island. More recently in the 1950s, a barite mine operated on Castle Island. Another stimulant to the local economy occurred in the 1960s with the introduction of large-scale logging in the area. One small mill continues to operate (ADF&G 1994).

Petersburg's main economic sector is seafood processing and manufacturing; government is the second largest employer. Other economic sectors include retail trade, construction, timber, and tourism (Shamrock FEIS, p. 3-50). The 1989 median household income was $49,318 (ADCRA 1995). Unemployment in 1994 was 9.2 percent, compared to 8.2 percent in all of southeast Alaska (*Alaska Economic Trends* 4:1995).

Subsistence Use

Local subsistence resource use includes deer, moose, salmon, finfish, waterfowl, clams, crabs, and berries. In 1987, the per capita subsistence harvest in Petersburg was 200 edible pounds. More than 93 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho and chinook salmon, halibut, deer, dungeness crab, king crab, shrimp, berries, and wood (TRUCS 1989).

Based on edible pounds harvested, land mammals at 31 percent, salmon at 22 percent, and shellfish at 17 percent are the most important subsistence resources for Petersburg households. Petersburg hunters generally travel to deer hunting areas by boat, either skiffs or larger commercial fishing boats.

Appendix C provides detailed maps regarding the areas that Petersburg households have ever used to hunt deer. Summarizing, the majority of Petersburg households hunt deer in Wildlife Analysis Areas (WAA's) 3938, 3939, and 3940. As displayed on the Deer Harvest by Community map (in the map packet), these areas are some distance from the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 3939 (257 deer), 3940 (136 deer), and 3938 (108 deer) (ADF&G 1994). These WAA's are virtually roadless.

Opinions

A number of Petersburg residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Petersburg residents who responded to the issues want more emphasis on scenic resources, recreation, fish, and wildlife. Opinion was split on subsistence with half wanting more emphasis on subsistence and half wanting less. Those who responded requested that the current timber sale program continue along with the long-term timber sale contracts. Residents were split in their opinion of road development with half recommending a reduction in emphasis and half requesting a mix of road development with other Forest uses. Opinion was split three ways regarding mineral exploration and development. Some want more emphasis on mineral exploration and development, others want less, and still others want a mix. Respondents are satisfied with the current amount of designated Wilderness. They want management to emphasize the tourism, wildlife, recreation, and subsistence sectors of their economy.

Most others who commented want more emphasis on subsistence, wildlife and tourism and less emphasis on timber. They want the long-term contracts terminated and do not want a road on the north side of Blind Slough. Others areas most often mentioned for protective management include Crystal Mountain, Cape Fanshaw, Farragut Bay, and Dall Island.

Direct, Indirect, and Cumulative Effects

Commercial fishing, and recreation and tourism are particularly important to Petersburg.

Commercial fisheries employment is not likely to be affected by forest management activities to any significant degree during the next ten years.

Recreation and tourism have become increasingly important to the economy of Petersburg. Recreation and tourism use is projected to increase roughly to the same degree in all alternatives, thereby benefiting retail trade.

The primary recreation and subsistence use areas for Petersburg are Duncan Canal, Mitkof Island, and Woewodski Island. Alternative 1 would maintain all of these areas in their current condition. Alternative 2 and 4 would allow timber harvesting in these areas but would modify the size and shape of cut units along Tongass Narrows, Duncan Canal and the Mitkof Island road system to visual quality objectives. In addition, Ideal Cove and the west shore of Duncan Canal would be allocated to the Old Growth Habitat LUD, and would not have any timber harvest. Alternatives 3, 4, 5 and 6 would have the same management as Alternative 2 plus some additional important wildlife areas would be allocated to the Old Growth Habitat LUD including west Mitkof, north Woewodski, Castle River and south Lindenburg. Alternative 7 would manage all of these areas for intensive timber production. Alternative 8 would emphasis intensive timber production, but would maintain key wildlife areas on west Mitkof, north Woewodski, Castle River, and south Lindenburg. Alternative 9 would emphasis intensive timber production, but would modify the size and shape of harvest units along the Tongass Narrows, Woewodski Island, west Duncan Canal and the Mitkof Island road system to meet visual quality objectives.

The Socio-economic Panel's assessment for Petersburg used in evaluating the effects described above resulted in the following estimated effects on community indicators:

PETERSBURG	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇑/⇔	⇔	⇓	⇔	⇓	⇑	⇑/⇔	⇑/⇔
Resource jobs - comm. fishing	⇑	⇓/⇔	⇑/⇔	⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇓/⇔	⇑/⇔	⇑	⇑	⇑	⇓	⇓/⇔	⇓
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇑/⇓	⇔	⇔	⇔	⇑/⇔	⇔	⇓	⇔	⇔
Community stability	⇓	⇔	⇔	⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓
Quality of life	⇓/⇔	⇓/⇔	⇔	⇑/⇔	⇑	⇑/⇔	⇓	⇔	⇓
Recreation opportunities	⇑	⇓/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓	⇓/⇔	⇓
Access to traditional lifestyle	⇑	⇓/⇔	⇔	⇔	⇑/⇔	⇔	⇓	⇓	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 52 percent of the total edible pounds of subsistence resources harvested by Petersburg households (Kruse and Frazier 1988).

Table 3-141 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Petersburg's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Petersburg hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Petersburg residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability for alternatives 2, 7 and 9 and these alternatives may have future inadequate habitat capability for the total deer hunted. At some point, a restriction in hunting may be necessary. Deer account for 21 percent of the total edible pounds of subsistence resources harvested by Petersburg households (Kruse and Frazier 1988).

Table 3-141. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Petersburg residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Petersburg Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
3939	257	297	2976	2975	2975	2975	2975	2975	2975	2975	2975	2975
3940	136	244	2670	2669	2669	2669	2669	2669	2669	2669	2669	2669
3938	108	267	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239
3731	91	148	1291	1200	1020	1200	1115.4	1115.4	1059	853	1192	775
3315	79	127	1392	1240	924	1167	1061.8	1061.8	943	759	1151	884
2007	52	188	3103	2322	1691	1806	1957.8	1995	1777	1534	1760	1556
1605	41	53	944	737	550	570	626.6	626.6	553	509	558	501
3308	37	201	4150	2824	2046	2246	2384.8	2384.8	2092	1815	2178	1811
1316	19	72	740	738	738	738	738	738	738	738	738	738
4146	19	158	907	908	908	908	908	908	908	908	908	908
Total	839	1755	21412	18852	16760	17518	17675	17713	16953	15999	17368	16056
% Change in Habitat Capability From 1995:				-12.0	-21.7	-18.2	-17.5	-17.3	-20.8	-25.3	-18.9	-25.0
Petersburg Harvest % of 2095 Capability:				4.5	5.0	4.8	4.7	4.7	4.9	5.2	4.8	5.2
Total Harvest % of 2095 Capability:				9.3	10.5	10.0	9.9	9.9	10.4	11.0	10.1	10.9

Petersburg households hunt throughout the forest but the majority of hunting occurs within Wilderness which will not change by alternative. Alternative 1 is unlikely to have direct impacts on Petersburg's subsistence use with little timber harvest activity occurring. Alternatives 7 and 9 will likely impact Petersburg's use area is within the development LUD's if timber harvesting continues or increases. Alternatives 3, 5, 6, and 8 will provide some habitat maintenance with Old Growth Habitat LUD's. Alternatives 2, 4 and 5 also provide habitat maintenance within recreation LUD's. Alternatives 4 and 5 may also increasing habitat with longer rotations. Only Alternative 1 restricts all of Petersburg's use area from possible timber activity.

Indirectly, Alternatives 2, 7, 8, and 9 which may offer opportunities for expanding access may increase competition if hunters from other communities come to Petersburg's use areas due to the increased access. But because much of Petersburg's hunting already occurs in Wilderness and areas with limited access, it is unlikely that competition in these areas would effect them.

Point Baker

Point Baker is located on the northern tip of Prince of Wales Island, 101 air miles northwest of Ketchikan. Point Baker received its name in 1793 from Captain George Vancouver. It has a population of 55, with no Natives (ADCRA 1995).

Native settlement of the area during Vancouver's time was already established. Tlingits used fish camps at Point Baker to participate in both customary trade and subsistence fishing. Commercial fishing at Point Baker began in the early 1900s, when the area was used as the site of a floating fish packer. Land sales in Point Baker accounted for part of an increase in year-round residents, the majority being non-Native (ADF&G 1994).

Point Baker is accessible by floatplane and skiff. Point Baker is not an incorporated city, nor is it within any other local government jurisdiction. It is not part of any Native organization and has no traditional council. The town is not recognized under the Alaska Land Claims Settlement Act. Residents of Point Baker are members of the Sumner Strait Fish and Game Advisory Committee (ADF&G 1994).

Economy

Commercial fishing began in the early 1990s when the area was used as the site of a floating fish packer. The first store was built in Point Baker in 1941, followed by a post office. Then, in 1955, the townsite was withdrawn from within the boundaries of the Tongass National Forest. In 1961, a floating dock was built by the State, replaced in 1968 by larger ones. The community has grown since the 1920s as increasing numbers of hand trollers used the area for home base, some of them eventually building homes there (ADF&G 1994).

In the 1990s, the Point Baker economy continues to be based upon fishing. The majority of the fishermen are hand trollers, although a few are power trollers and gillnetters. Besides commercial fishing, other economic enterprises include a bar, a restaurant, a grocery store, laundry facilities, a post office, fuel sales, and gasoline and diesel sales on a floating dock. Today, the Point Baker bar and store also serves as the fish buyer (ADF&G 1994).

The main economic sector for Point Baker is fishing. The 1989 median household income was $12,083 (ADCRA 1995). Unemployment for this census area was 12.5 percent, compared with 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita subsistence harvest in Point Baker was 344 edible pounds, one of the highest in all Southeast. All households harvested some subsistence resource. Most commonly used (by over 50% of households) were chinook salmon, cod, halibut, rockfish, deer, dungeness crab, clams and cockles, berries, and wood (TRUCS 1989).

Based on edible pounds harvested, deer at 27 percent, salmon at 26 percent and finfish other than salmon at 19 percent are the most important subsistence resources for Point Baker households (Kruse and Frazier 1988).

Point Baker hunters travel an average of nine miles to their most reliable deer hunting areas (Kruse and Frazier 1988). Harvest data from the ADF&G show that most of Point Baker's deer harvest during the years of 1987 through 1990 occurred on the northwest corner of Prince of Wales Island.

Appendix C provides detailed maps regarding the areas that Point Baker households have ever used to hunt deer. Summarizing, the majority of Point Baker households hunt deer in Wildlife Analysis Areas (WAA's) 1528, 1529, and 1526. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA 1529 (16 deer) (ADF&G 1994). This WAA is 64 percent accessible by existing roads.

Opinions

A number of Point Baker and Port Protection residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Community residents who responded to the issues want more emphasis on scenic resources, recreation, fish, wildlife, and subsistence. The Sumner Strait Fish and Game Advisory Committee would also like to see management emphasize wildlife and subsistence. Individual respondents and the Committee want the current timber sale program reduced, and the long-term contracts terminated. They do not want additional roads, log transfer facilities or connections to other existing roads. The Advisory Committee is opposed to emphasizing mineral exploration and development and favors additional Wilderness designations as do community residents. Both groups believe a balanced combination of timber, mining, tourism, recreation and fishing would be most desirable for the economy.

Direct, Indirect, and Cumulative Effects

Commercial fisheries and subsistence use are important to Point Baker.

Commercial fisheries employment is not likely to be affected by forest management activities to any significant degree during the next ten years.

The Socio-economic Panel's assessment for Point Baker used in evaluating the effects described above resulted in the following estimated effects on community indicators:

Note: The Socioeconomic Panel did not distinguish between Point Baker and Port Protection in their analysis of effects of the proposed alternatives on these two communities. Thus, the following table applies to Port Protection.

POINT BAKER	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔
Resource jobs - comm. fishing	⇑	⇓	⇑/⇔	⇓/⇔	⇔	⇔	⇓	⇓/⇔	⇓
Resource jobs - rec/tourism	⇑/⇔	⇓/⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇑/⇔	⇓/⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Community stability	⇑/⇔	⇓/⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Quality of life	⇑/⇔	⇓	⇓/⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓
Recreation opportunities	⇑	⇓	⇑/⇓	⇑/⇔	⇑	⇑/⇔	⇓	⇓/⇔	⇓
Access to traditional lifestyle	⇑/⇔	⇓/⇔	⇓/⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 59 percent of the total edible pounds of subsistence resources harvested by Point Baker households (Kruse and Frazier 1988).

Table 3-142 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Point Baker's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Point Baker hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Point Baker residents, as well as for all deer hunted within the WAA's. Deer account for 27 percent of the total edible pounds of subsistence resources harvested by Point Baker households (Kruse and Frazier 1988).

Table 3-142. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Point Baker residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Pt. Baker Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1529	16	43	2051	1760	1395	1552	1564	1601	1495	1270	1494	1311
Total	16	43	2051	1760	1395	1552	1564	1601	1495	1270	1494	1311
% Change in Habitat Capability From 1995:				-14.2	-32.0	-24.3	-23.7	-21.9	-27.1	-38.1	-27.2	-36.1
Point Baker Harvest % of 2095 Capability:				0.9	1.1	1.0	1.0	1.0	1.1	1.3	1.1	1.2
Total Harvest % of 2095 Capability:				2.4	3.1	2.8	2.7	2.7	2.9	3.4	2.9	3.3

Alternative 1 would provide the greatest habitat maintenance for Point Baker's subsistence uses although some timber harvest activity could occur in their use area although none is scheduled. Alternatives 3, 5, 6, and 8 would offer some maintenance of habitat with Old Growth Habitat LUD's within a small portion of Point Baker's use area. Alternatives 2, 3, 4, 5, and 8 also offer maintenance of some of Point Baker's use area within recreation LUD's. Aside from these Old Growth Habitat and recreation LUD's, Alternatives 2 - 9 may have direct effects on Point Baker's use area within the development LUD's. These LUD's prescriptions indicate continued and possibly increased timber harvest and possible mining activity. Alternatives 4 and 5 have longer rotations which would provide Point Baker with a higher level of older forest within the development LUD's they use.

Competition is likely to indirectly affect Point Baker in Alternatives 2- 9 as displaced hunters from other communities may be able to travel to Point Baker for hunting as the access opportunities increase with development. These same access opportunities may also increase Point Baker's opportunities to access more area, and possibly lower their access costs.

Port Alexander

Port Alexander is located on the southern tip of Baranof Island about 85 miles south of Sitka. Its population of 118 includes 2.5 percent Alaska Native (ADCRA 1995).

The site was named in 1849 by the governor of the Russian American colonies. In 1913, salmon trollers discovered the rich fishing grounds of the area, and two floating processors arrived soon after. By 1916 there was a fishing supply store, a shore station, and a bakery at Port Alexander. During the 1920s and 1930s a prosperous fishing fleet evolved, and houses, stores, restaurants, and a school were constructed. The 1940s and 1950s saw a steep decline in Port Alexander's population. Today people choose Port Alexander as a home because of its independent, subsistence lifestyle, and commercial fishing opportunities, as well as its remote setting. There are no roads in Port Alexander; travel within the community is by skiff, boardwalks and footpaths (ADF&G 1994).

The community has a local Fish and Game Advisory Committee.

Economy

During the 1920s, Port Alexander harbored the largest salmon trolling fleet in Alaska. By 1938, local salmon and herring stocks had decreased. The outbreak of World War II made remaining levels of processing uneconomical and finished the collapse of the town's economy. By 1950, only 22 residents were counted in the census, and throughout the 1950s and 60s only a few families, comprised mainly of trollers and retirees, remained in Port Alexander (ADF&G 1994).

During the 1970s, Port Alexander's population began to increase again. Federal land transfers and state land disposals provided opportunities for new families and individuals to establish homes in the community. Fisheries employ almost three-quarters of the residents of Port Alexander. The 1989 median household income was $20,625 (ADCRA 1995). Unemployment in 1994 for this census area was 9.2 percent, compared to 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita subsistence harvest in Port Alexander was 306 edible pounds. All households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho and chinook salmon, cod, halibut, rockfish, deer, clams and cockles, berries, plants, seaweed, and wood (TRUCS 1989).

Based on edible pounds harvested, deer at 36 percent and salmon and finfish other than salmon at 23 percent each are the most important subsistence resources for Port Alexander households. Port Alexander hunters travel an average of four miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Port Alexander households have ever used to hunt deer. Summarizing, the majority of Port Alexander households hunt deer in Wildlife Analysis Areas (WAA's) 3207, 3733, and 3734. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA 3734 (50 deer) (ADF&G 1994). This WAA is roadless.

Opinions

A number of Port Alexander residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Port Alexander residents who responded to the issues along with the City of Port Alexander want more emphasis on fish, wildlife, and subsistence. The City wants the current timber sale program reduced and the long-term contracts terminated. The City does not want additional roads, log transfer facilities or connection to existing roads. While the City is opposed to emphasizing mineral exploration and development, individual respondents are split in their opinion with half wanting more emphasis and half wanting a mix. The City wants management to emphasize tourism, wildlife, recreation and subsistence sectors of the economy.

Direct, Indirect, and Cumulative Effects

Port Alexander is primarily a commercial fishing town. Commercial fishing and subsistence use will continue to be important to the community.

Commercial fishing is not expected to be significantly affected by Forest Service activities during the next ten years.

The Socio-economic Panel's assessment for Port Alexander used in evaluating the effects described above resulted in the following estimated effects on community indicators:

PORT ALEXANDER	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇔	⇓/⇔
Resource jobs - rec/tourism	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Community stability	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Quality of life	⇑	⇓/⇔	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔
Recreation opportunities	⇑	⇓/⇔	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔
Access to traditional lifestyle	⇑	⇓/⇔	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 55 percent of the total edible pounds of subsistence resources harvested by Port Alexander households (Kruse and Frazier 1988).

Table 3-143 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Port Alexander's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Port Alexander hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Port Alexander residents, as well as for all deer hunted within the WAA's. Deer account for 36 percent of the total edible pounds of subsistence resources harvested by Port Alexander households (Kruse and Frazier 1988).

Table 3-143. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Port Alexander residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Port. Alex. Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
3734	50	120	2057	2057	2057	2057	2057	2057	2057	2047	2056	2057
Total	50	120	2057	2057	2057	2057	2057	2057	2057	2047	2056	2057

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
% Change in Habitat Capability From 1995:	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	0.0	0.0
Port Alexander Harvest % of 2095 Capabilit	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Total Harvest % of 2095 Capability:	5.8	5.8	5.8	5.8	5.8	5.8	5.9	5.8	5.8

Subsistence use in Port Alexander is unlikely to be directly affected by any of the alternatives as their most heavily used areas are within Wilderness or are allocated as recreation LUD's, and will be maintained under any option.

Indirectly, it is unlikely that Port Alexander will be affected by increased competition or access because of the limited area open for development. The current limited access is unlikely to draw additional hunters into the area due to displacement.

The southern end of Kuiu Island is currently not open for deer harvesting. This area is accessible to Port Alexander households if it were to open for hunting in the future. If that were to happen, only Alternative 1 allocates the area as a recreation LUD, Alternatives 2 - 9 allocates the area to a development LUD.

Port Protection

Port Protection is located at the northern end of Prince of Wales Island and is only accessible by air and water. The nearby logging camp at Labouchere Bay, however, is a roaded port. The community's setting along the water front of the cove requires skiff travel for most purposes (ADF&G 1994).

Port Protection is not an incorporated city, nor is it within any local government jurisdiction. Residents of Port Protection are members of the Sumner Strait Fish and Game Advisory Committee (ADF&G 1994). Located on the northern tip of Prince of Wales Island in a quiet bay facing Sumner Strait, Port Protection has a population of 48, 1.6 percent of whom are Alaska Native (ADCRA 1995).

Port Protection was first reported to the western world by the English explorer George Vancouver in 1793. Signs of earlier indigenous occupation of the northern shoreline of Prince of Wales Island include stone and wooden stake fish weirs and traps, as well as shell middens of edible marine invertebrates (ADF&G 1994).

A scow served as a fish-buying station until it was replaced in 1946 by a trading post. A long float dock accommodated many fishing boats at the post (ADF&G 1994).

Economy

In the 1880s, salmon salteries were constructed in adjacent bays on Sumner Strait, and for two decades harvested thousands of sockeye for commercial markets. After the turn of the century commercial fishing in the area developed into purse seine and troll fisheries, and subsistence uses continued through commercial fishing as well as non-commercial harvest of a wide range of resources. During the 1970s homesites in Port Protection were acquired by new residents under State of Alaska land disposal programs (ADF&G 1994).

Port Protection has been characterized by a seasonal cash economy with its peak during the summer and fall fishing seasons, and by a subsistence way of life. The main economic sector for Port Protection is fishing. Its 1989 median household income was $10,000 (ADCRA 1995). Unemployment for this census area was 12.5 percent in 1994, compared with 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita subsistence harvest in Port Protection was 311 edible pounds. All households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho, chinook, pink, and sockeye salmon, cod, halibut, rockfish, deer, dungeness crab, clams and cockles, berries, plants, seaweed, and wood (TRUCS 1989).

Based on edible pounds harvested, salmon at 36 percent, finfish other than salmon at 29 percent, and deer at 13 percent are the most important subsistence resources for Point Protection households (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Port Protection households have ever used to hunt deer. Summarizing, the majority of Port Protection households hunt deer in Wildlife Analysis Areas (WAA's) 1528, 1529, and 1526. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA 1529 (16 deer) (ADF&G 1994). This WAA is 64 percent accessible via existing roads.

Opinions

A number of Point Baker and Port Protection residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Community residents who responded to the issues want more emphasis on scenic resources, recreation, fish, wildlife, and subsistence. The Sumner Strait Fish and Game Advisory Committee would also like to see management emphasize wildlife and subsistence. Individual respondents and the Committee want the current timber sale program reduced, and the long-term contracts terminated. They do not want additional roads, log transfer facilities or connections to other existing roads. The Advisory Committee is opposed to emphasizing mineral exploration and development and favors additional Wilderness designations as do community residents. Both groups believe a balanced combination of timber, mining, tourism, recreation and fishing would be most desirable for the economy.

Direct, Indirect, and Cumulative Effects

Port Protection is primarily a commercial fishing village; subsistence use is also important.

Commercial fisheries employment is not likely to be affected by forest management activities to any significant degree during the next ten years.

The Socio-economic Panel's assessment for Port Protection used in evaluating the effects described above resulted in the following estimated effects on community indicators:

PORT PROTECTION	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔
Resource jobs - comm. fishing	⇑	⇓	⇑/⇔	⇓/⇔	⇔	⇔	⇓	⇓/⇔	⇓
Resource jobs - rec/tourism	⇑/⇔	⇓/⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇑/⇔	⇓/⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Community stability	⇑/⇔	⇓/⇔	⇔	⇑/⇔	⇑/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔
Quality of life	⇑/⇔	⇓	⇓/⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓
Recreation opportunities	⇑	⇓	⇑/⇓	⇑/⇔	⇑	⇑/⇔	⇓	⇓/⇔	⇓
Access to traditional lifestyle	⇑/⇔	⇓/⇔	⇓/⇔	⇑/⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 80 percent of the total edible pounds of subsistence resources harvested by Port Protection households (Kruse and Frazier 1988).

Note: The Subsistence Analysis did not distinguish between Point Baker and Port Protection in the effects of the proposed alternatives on subsistence use on the two communities. Please refer to Point Baker for the table and description of effects.

Saxman

Saxman is located on west Revillagigedo Island on the Tongass Highway, about three miles south of Ketchikan. Its population is 394, with 77 percent Alaska Native (ADCRA 1995).

In 1894, Tlingits from the old Cape Fox and Tongass villages chose Saxman as the site for a new village in which to locate a government school and a new Presbyterian church. The Saxman people are also known as the Cape Fox people or Sanya in the earlier ethnographies. Saxman was incorporated in 1929 and was certified by the federal government as a second class municipal corporation. Three years later, the federal government issued a patent to 365 acres of land to the townsite trustee for Saxman (ADF&G 1994).

When the Ketchikan Gateway Borough was formed in 1963, Saxman was included within its boundaries. In 1971 and 1973, respectively, Saxman was recognized and then certified as a Native village under the Alaska Native Claims Settlement Act. An elected mayor and six city council members constitute the governing body of the municipality as organized under state law. The community has a local Fish and Game Advisory Committee (ADF&G 1994).

When the Tlingits left their old villages to move to Saxman, they abandoned houses, totems, carvings and other cultural and ceremonial artifacts. In 1938, the Civilian Conservation Corps retrieved and brought to Saxman original totems from the abandoned villages and cemeteries of Tongass, Cat, and Pennock Islands, and Cape Fox. The Totem Park in Saxman has become a major attraction for Ketchikan area visitors (ADF&G 1994).

Economy

Fishing and cutting lumber for the growing town of Saxman were the early economic mainstays. Although Saxman residents still depend on Ketchikan for most services and employment opportunities, development of a barge terminal, a fishing fleet, and the Cape Fox Village Corporation investments have led to some recent growth in Saxman's population and economic base. The Saxman Totem Park was recently expanded to a cultural center, including a tribal house, a totem carving shed and a hall for traditional Tlingit dance exhibitions which draw many tourists.

Major economic sectors at Saxman are timber, government, tourism and retail trade. Median household income in 1989 was $30,481 (ADCRA 1995). Unemployment in the Ketchikan census area in 1994 was 8.3 percent, compared to 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita subsistence harvest in Saxman was 89.3 edible pounds. More than 83 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho, sockeye salmon, halibut, herring roe on kelp, deer, clams and cockles, and berries (TRUCS 1989).

Based on edible pounds harvested, salmon at 37 percent, finfish other than salmon at 20 percent and deer at 19 percent are the most important subsistence resources for Saxman households. Saxman hunters travel an average of 20 miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Saxman households have ever used to hunt deer. Summarizing, the majority of Saxman households hunt deer in Wildlife Analysis Areas (WAA's) 1003, 1422, and 1531. As displayed on the Deer Harvest by Community map (in the map packet), these areas are a distance from the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 406 (2 deer) and 408 (2 deer) (ADF&G 1994). These WAA's are six percent accessible by existing roads.

Opinions

Saxman residents provided oral testimony on the TLMP Revision 1990 DEIS. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Residents expressed concern about the effects of timber harvesting on subsistence salmon streams. They do not want logging in domestic watersheds or storage of timber where it will affect returning salmon. They expressed opposition to clearcutting and prefer only limited road construction. Concern was expressed for total traditional Native subsistence lifestyle and tribal sovereignty.

Direct, Indirect, and Cumulative Effects

Saxman, a traditional native community, could be affected primarily by changes in recreation and tourism use, commercial fishing, timber processing, and subsistence opportunities.

The timber industry would be subject to the largest amount of variation among the alternatives. Alternative 1 would likely result in the closure of the KPC Sawmill, the KPC Pulp Mill, and Seaborne Lumber. This could significantly reduce the employment level, tax base, and income level within the community. Alternatives 4 and 5 would likely result in the closure of the pulp mill and either Seaborne Lumber or one of KPC's sawmills if timber prices increase. If timber prices remain constant, Alternatives 4 and 5 would likely close the pulp mill, Seaborne Lumber, and one of KPC's sawmills. Alternatives 6 and 8 should supply enough timber to operate both sawmills at full capacity if prices increase, and enough timber for at least one shift if prices remain constant. Alternatives 6 and 8 should yield enough pulp material for the pulp mill to operate at full capacity if KPC is able to purchase all the pulp grade logs from independent operators. Alternative 3 would provide enough timber supply to operate both the KPC sawmills and Seaborne Lumber operating at one shift. In addition, there would be enough timber supply to operate one of these mills at full capacity if timber prices increase. The alternative should provide enough pulp material to operate the pulp mill at historic capacity; if timber prices increase, there would be enough pulp material to operate the pulp mill at full capacity. Otherwise, higher grade logs would need to be run through the pulp mill to operate at full capacity. Alternatives 2, 7 and 9 should provide enough timber to operate the pulp mill and both sawmills at full capacity.

Commercial fisheries employment is not likely to be affected by forest management activities to any significant degree during the next ten years.

Recreation and tourism have become increasingly important to the economy of Saxman. The Ketchikan downtown dock has been expanded to accommodate additional cruise ships, and the Totems and Tribal House in Saxman are one of the premier attractions in Southeast. Recreation and tourism use is projected to increase roughly to the same degree in all alternatives benefiting retail trade in Saxman. However since Alternatives 1, 4 and 5 result in the closure of the pulp mill plus some or all of the sawmills, the resulting declines in timber employment could have a ripple effect and reduce retail trade and services employment. This would be especially true during September through May when recreation and tourism use is much lower.

The most important subsistence opportunities for Saxman residents include Duke Island, Cleveland Peninsula, Revilla Island, Gravina Island, and Misty Fiords. Alternative 1 maintains all of these areas in essentially their current condition. This would provide for remote and semi-remote recreational opportunities but would preclude road access for residents to the northern end of Revilla Island via Carrol River. Alternatives 2 and 9 would allow some timber harvest on Cleveland Peninsula and Revilla Island including a potential road connection out of town to the northern part of Revilla. Gravina Island and Misty Fiords would remain in their current condition. Alternative 3 would allow some timber harvesting on Cleveland Peninsula but avoid Union Bay. The visual quality would be maintained in Helm Bay. Some timber harvesting would be permitted on Revilla Island, but key recreation and wildlife areas would be avoided. Misty Fiords and Gravina Island would be maintained in the current condition. Alternative 4 would maintain Revilla, Gravina and Misty Fiords in their current condition. Some timber harvesting would be permitted on Cleveland Peninsula but would be mitigated to maintain important recreation places. Alternatives 5 and 6 would maintain Revilla, Gravina and Misty Fiords in their current condition. Some timber harvesting would be permitted on Cleveland Peninsula but would be mitigated to maintain important wildlife and recreation places. Alternative 7 would allow intensive timber harvest on Cleveland Peninsula, Gravina, and Revilla Island. Misty Fiords would be maintained in its current condition. Alternative 8 would allow intensive timber harvest while maintaining important wildlife areas on Cleveland Peninsula, Gravina, and Revilla Island. Misty Fiords would be maintained in its current condition.

The Socio-economic Panel's assessment for Saxman used in evaluating the effects described above resulted in the following estimated effects on community indicators:

SAXMAN	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇔	⇑	⇔	⇑/⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇑/⇔	⇔	⇔	⇔	⇓	⇓/⇔	⇓
Resource jobs - rec/tourism	⇑	⇔	⇔	⇑/⇔	⇔	⇔	⇓	⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇓/⇔	⇓/⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓/⇔	⇔	⇓/⇔
Community stability	⇓/⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇓	⇔	⇓/⇔
Quality of life	⇑/⇓	⇓/⇔	⇑/⇔	⇑	⇑	⇑/⇔	⇓	⇔	⇓
Recreation opportunities	⇑	⇓/⇔	⇑/⇔	⇑	⇑	⇔	⇓	⇓/⇔	⇓
Access to traditional lifestyle	⇑/⇔	⇓/⇔	⇑/⇔	⇑	⇑	⇑/⇔	⇓	⇔	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 68 percent of the total edible pounds of subsistence resources harvest by Saxman households (Kruse and Frazier 1988).

Table 3-144 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Saxman's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Saxman hunters as a percent of the estimated year 2095

Table 3-144. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Saxman residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Saxman Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
406	2	84	2409	2316	1761	1978	1999	1999	1788	1582	1875	1649
408	2	36	361	358	358	359	358	358	358	358	358	358
1315	1	150	2076	1907	1499	1606	1696	1717	1575	1412	1569	1402
Total	5	270	4846	4581	3618	3943	4053	4074	3721	3352	3802	3409
% Change in Habitat Capability From 1995:				-5.5	-25.3	-18.6	-16.4	-15.9	-23.2	-30.8	-21.5	-29.7
Saxman Harvest % of 2095 Capability:				0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Harvest % of 2095 Capability:				5.9	7.5	6.8	6.7	6.6	7.3	8.1	7.1	7.9

habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for the effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Saxman residents, as well as for all deer hunted within the WAA's. Deer account for 19 percent of the total edible pounds of subsistence resources harvested by Saxman households (Kruse and Frazier 1988).

Some of the Saxman household's use area is non-National Forest System Lands which will not be affected by any of the alternatives. With little timber harvest activity, Alternative 1 would have the least effect on Saxman's subsistence uses. Alternatives 3, 5, 6, and 8 allocate much of Saxman's subsistence use areas to natural setting LUD's including the Old Growth Habitat LUD. It is unlikely that these alternatives will directly impact Saxman's use of the area. Alternatives 2 and 4 allocate some of this same area to natural setting LUD's, but does not contain Old Growth Habitat LUD allocation. Alternatives 7 and 9 allocate much of Saxman's subsistence use areas to development LUD's, but also allocates some habitat within a recreation LUD. Even with that designation, Alternatives 7 and 9 will likely impact Saxman's subsistence use through timber harvest activity. Alternative 4 and 5, with a longer rotation, would likely maintain the habitat within all of Saxman's use areas over time.

The displacement of hunters that may occur in Alternative 2 - 9 with continued or increased timber harvesting would likely increase competition for deer with other communities. The impact of increased competition may not greatly affect Saxman households who already travel long distances to hunt. An increase in access opportunities may create lower cost access for Saxman subsistence use.

Sitka

Located on the west side of Baranof Island, Sitka is the only community in Southeast Alaska that fronts the open sea. Its population is 9,052, 21 percent of whom are Alaska Native (ADCRA 1995). Present-day Sitka was originally inhabited by a major tribe of Tlingits who called the village "Shee Atika." Traditionally the Tlingits used a wide area surrounding the community for hunting, fishing, and gathering wild resources. The site became "New Archangel" in 1799 as the capital of Russian America (ADF&G 1994).

Sitka became the focal point of Russian fur trade in North America beginning in 1741. During the mid-1800s, Sitka was the major port on the north Pacific coast, with ships calling from many nations. After the purchase of Alaska by the U.S. in 1867, it remained the capital of the Territory until 1906, when the seat of government moved to Juneau. During the early 1900s gold mines contributed to its growth, and during World War II the town was fortified. After the war, the Bureau of Indian Affairs converted some of the buildings to a boarding school for Alaska Natives (ADF&G 1994).

Economy

After the fur trade era, fishing and fish processing dominated Sitka's economy for a time. The development of refrigeration, which opened new markets for fisheries, led to the opening of Sitka's first cold storage plant in 1913 which processed salmon, halibut, crab, and black cod. Major changes in Sitka since 1940 include construction of a large World War II military base on Mt. Edgecumbe Island, and construction of a large hospital and related facilities during the 1950s' tuberculosis epidemic (ADF&G 1994).

Other important elements in Sitka's economic growth include the establishment of Mount Edgecumbe boarding school and the expansion of the U.S. Coast Guard facilities in 1977 to enforce the 200-mile fisheries limit. The Halibut Producers Cooperative (now Seafood Producers Cooperative) built a major cold storage plant in 1980, used for processing salmon, black cod, herring, and halibut (ADF&G 1994). Sitka is also port-of-call to many cruise ships each summer, bringing in thousands of tourists.

Until it closed in September 1993, however, the largest employer in town was the pulp mill, opened in 1959 by Japanese-owned Alaska Lumber and Pulp Company (later named Alaska Pulp Company [APC]). The mill employed almost 400 people, with $19 million in its annual payroll. The impact of its closure is still not completely known (Sitka Economic Development Commission (SEDC), *Sitka Economic Base Study,* 1995).

Sitka's economy is now based on health care, tourism, education, commercial fishing and services, and local, state, and federal government. The town's largest private employer is now the Southeast Alaska Regional Health Corporation (SEDC 1995).

Sitka's median income per household in 1989 was $43,337, placing it sixth among Southeast communities in size of median income. The high number of those employed in health, education, tourism and fishing positions (46.9 percent of the work force) indicates a seasonal and part-time pattern of employment, with multiple job holdings by households (SEDC 1995). Unemployment in 1994 in the Sitka census area was 9.9 percent, compared to 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995).

The community is currently investigating ways to increase activity in ecotourism, education and fisheries, according to a draft comprehensive plan released in February 1995. The Forest Service is cooperating with the city of Sitka in a study to find alternative wood products industries to replace the economic sector lost with the mill closure.

Subsistence Use

In 1987, the per capita subsistence harvest in Sitka was 146 edible pounds. More than 88 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were salmon and berries (TRUCS 1989).

Based on edible pounds harvested, salmon at 28 percent, deer at 27 percent and finfish other than salmon at 25 percent are the most important subsistence resources for Sitka households. Sitka hunters travel an average of 24 miles to their most reliable deer hunting areas (TRUCS 1989).

A 1982 study by the Division of Subsistence found the overall level of resource use in Sitka high. Many Sitka residents reported a heavy dependency on use of local fish and wildlife resources (Schroeder and Nelson 1983). Resource use was locally perceived to have been increasing over the five years preceding the study. The number of hunting licenses and subsistence permits issued in the previous ten years increased much faster than the population of Sitka. As a subsistence activity, food harvesting is reported to be the foundation of the Native culture in Sitka. It also seems to be a crucial element in the adaptation that many non-Native Sitkans have made to life in Alaska (ADF&G 1994).

Appendix C provides detailed maps regarding the areas that Sitka households have ever used to hunt deer. Summarizing, the majority of Sitka households hunt deer in Wildlife Analysis Areas (WAA's) 3001, 3002, and 3314. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 3001 (511 deer), 3002 (335 deer), and 3104 (299 deer) (ADF&G 1994). These WAA's are 19, 11, and 30 percent accessible by existing roads.

Opinions

A number of Sitka residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Sitka residents who responded to the issues, and the City and Borough of Sitka, requested that additional emphasis be placed on scenic resources. While individuals requested that less emphasis be placed on managing for recreation, the Sitka State Parks Advisory Board requested that additional emphasis be placed on recreation.

The City and Borough requested additional emphasis on fish and wildlife and the Sitka Advisory Committee requested additional emphasis on subsistence. Individuals are split with some wanting more emphasis on subsistence, some less, and still others satisfied with existing management emphasis.

The City and Borough recommended that the current timber sale program continue. However, residents were split in their opinion with half wanting the same mix of emphasis and half wanting less timber harvest. Some individual respondents favored additional roads, transfer facilities, and encouraged connecting existing roads. Certain residents also support additional emphasis on access for mineral exploration and development. Some individual respondents favored emphasizing timber and mining economic sectors. Other individuals and the Sitka State Parks Advisory Board want management to emphasize tourism, wildlife, recreation, and subsistence.

Direct, Indirect, and Cumulative Effects

Commercial fishing, recreation and tourism, subsistence and the timber industry are important to Sitkans.

The APC Pulp Mill closed in Sitka in 1994. Some members of the community have expressed interest in the possibility of continued wood processing in Sitka to replace the Pulp Mill, including a medium density fiberboard (MDF) plant. There should be enough material to open a MDF plant in Alternatives 2, 7 and 9. Alternatives 6 and 8 should make enough pulp material available for this plant if timber prices increase. All alternatives, except Alternative 1, would provide enough pulp material for an MDF plant should the KPC Pulp Mill close.

Commercial fishing is not expected to be significantly affected by Forest Service activities during the next ten years.

Recreation and tourism use is expected to increase by roughly the same amount in all alternatives. This should benefit retail and services sectors in Sitka.

The Socio-economic Panel's assessment for Sitka used in evaluating the effects described above resulted in the following estimated effects on community indicators:

SITKA	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑	⇑	⇑/⇔	⇑
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇑/⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇔	⇑/⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇓/⇔	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑	⇔	⇑
Community stability	⇓/⇔	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑	⇔	⇑
Quality of life	⇑/⇔	⇔	⇔	⇔	⇑	⇔	⇑/⇓	⇓/⇔	⇑/⇓
Recreation opportunities	⇑	⇓/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓	⇓/⇔	⇓
Access to traditional lifestyle	⇑	⇓/⇔	⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 69 percent of the total edible pounds of subsistence resources harvest by Sitka households (Kruse and Frazier 1988).

Table 3-145 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Sitka's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. If it is assumed that 20 percent of a population can be harvested per year in an area without wolves and still maintain viable populations, then all of the alternatives should be able to provide the deer hunted by Sitka households within the WAA's. Alternatives 1, 3, 4, 5, and 6 indicate adequate supply for the total deer hunted within the WAA's. Alternatives 2, 7, 8 and 9 indicate an inadequate supply for the total deer hunter within the WAA's and there may have to be a restriction in hunting at some point within the WAA's. Deer accounts for 27 percent of the total edible pounds of subsistence resources harvested by Sitka households (Kruse and Frazier 1988).

Table 3-145 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Sitka's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Sitka hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort decreases, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. Sitka residents are currently harvesting approximately 15 percent of habitat capability each year; Sitkan and other hunters combined are currently harvesting approximately 18 percent of habitat capability, which is close to a rate that may not be sustainable. Implementation of any alternative would result in less than 20 percent of habitat capability being harvested by Sitkans; however for total hunting, Alternatives 2, 7, 8, and 9 would exceed 20 percent of the habitat capability being harvested in year 2095. At some point, a restriction in hunting may be necessary for all alternatives. Deer accounts for 27 percent of the total edible pounds of subsistence resources harvested by Sitka households (Kruse and Frazier 1988).

Table 3-145. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Sitka residents obtain approximately 75% of their average annual deer harvest.

WAA*	Average Deer Harves From 1987-1994: Sitka Residents	Average Deer Harves From 1987-1994: All Hunters	1995 Deer Habitat Capability	Deer Habitat Capability by Alternative at 2095: Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
3001	511	723	3420	3420	2456	3420	3420	3420	3420	2890	2896	2125
3002	335	566	1067	1067	695	1067	1067	1067	1067	625	691	654
3104	299	260	3130	2460	1937	2271	2278.2	2278.2	2157	2214	2262	1853
3003	257	341	1381	1381	1095	1381	1381	1381	1381	948	1270	909
3310	222	245	1442	1328	1328	1328	1328	1328	1328	1328	1328	1328
3311	219	295	1532	1532	1215	1532	1532	1532	1532	1084	1194	1139
3105	165	157	1949	1937	1895	1937	1911.8	1911.8	1895	1708	1874	1708
3206	147	143	939	938	938	938	938	938	938	938	938	938
3416	145	191	1690	1689	1689	1689	1689	1689	1689	1689	1689	1689
3309	144	152	1001	1001	869	1001	1001	1001	1001	830	848	830
3312	144	141	438	438	319	438	438	438	438	283	355	311
Total	2588	3214	17989	17191	14436	17002	16984	16984	16846	14537	15345	13484
% Change in Habitat Capability From 1995:				-4.4	-19.8	-5.5	-5.6	-5.6	-6.4	-19.2	-14.7	-25.0
Sitka Harvest % of 2095 Capability:				15.1	17.9	15.2	15.2	15.2	15.4	17.8	16.9	19.2
Total Harvest % of 2095 Capability:				18.7	22.3	18.9	18.9	18.9	19.1	22.1	20.9	23.8

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

WAA's 3001, 3002, 3003, 3311, 3309, and 3312 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. Sitka households hunt throughout Chichagof Island with some hunting occurs within Wilderness and LUD II designations which will not change by alternative. Alternative 1 is unlikely to have direct impacts on Sitka's subsistence use with little timber harvest activity occurring. Alternatives 7 and 9 will likely impact Sitka's use area within the development LUD's if timber harvesting continues or increases. Additionally, Alternative 7 allocates a portion of Sitka's highest use area to a recreation LUD. Alternatives 2, 4, 5, and 6, will provide some habitat maintenance with recreation LUD's, but much of Sitka's high use areas would be allocated to a development LUD. Alternatives 4 and 5 may improve subsistence resource habitat with longer rotations. Alternatives 3 and 8 greatly increase the likelihood of maintaining subsistence uses throughout the Old Growth Habitat LUD designations. But only Alternative 1 allocates the majority of all of Sitka's use area to a natural setting LUD.

Indirectly, alternatives which offer opportunities for expanding access may increase competition if hunters from other communities come to Sitka's use areas due to the increased access connected to the ferry system.

Skagway

Skagway is located in northern Southeast Alaska at the head of Taiya Inlet, 95 air miles north of Juneau. It is the end-of-the line for the Alaska Marine ferry and the entrance to the Klondike Highway. Its population of 751 includes 5.5 percent Alaska Native (ADCRA 1995).

Prior to the founding of the community the area was settled by Chilkoot Tlingit who called it "Skagua," or "the place where the north wind blows." The Chilkoots controlled access into the interior along what has become known as the Chilkoot Trail, which follows the Taiya River over the Chilkoot Pass. It was a major trade route for the Chilkoot Tlingit with interior Tlingit and Athabaskans (ADF&G 1994).

Settlement began in Skagway in 1887 when an old seaman named William Moore decided to develop a trading and mining route into the Yukon Territory using the Chilkoot Trail. As the Klondike gold rush hit the area in 1896, the Chilkoot Trail became the major route into the Interior. Within a few years the trail was superseded by the adjacent White Pass and Yukon Railway. The railway continued to function as a supply and shipping route between Skagway and Whitehorse until 1982 (ADF&G 1994).

Skagway is incorporated as a first class city. The community participates in the Upper Lynn Canal Fish and Game Advisory Committee (ADF&G 1994).

Economy

During the Klondike gold rush days, the town of Skagway became well-established as a staging area for hopeful prospectors. Skagway became Alaska's first incorporated city in 1900. As the gold rush waned, Skagway's businesses concentrated on serving as a port city for the Yukon Territories. After World War I, cruise ships stopped at Skagway and tourism increased; World War II brought a temporary boom with pipeline construction and the presence of military personnel. Throughout the 20th century, the mining industry and tourism maintained the economic base of the community. In 1975, part of the city was included in the Klondike Gold Rush National Historic Park; tourism continues to play an important role in Skagway's economy (ADF&G 1994).

Major employment sectors of Skagway are retail trade, entertainment, recreation, tourist services, and transportation. It is the shipping center for zinc and copper from the Yukon. The present mainstay of Skagway's economy is tourism. Approximately 300,000 tourists arrive each year on cruise ships.

The 1989 median household income was $37,500 (ADCRA 1995). Unemployment in this census area was 10.6 in 1994, compared to 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995).

Opinions

A number of Skagway residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Skagway residents who responded to the issues recommended that the Forest be managed for both scenic quality and timber harvesting, with more emphasis on recreation. Community opinion was split on fish management and wildlife management with half wanting more emphasis and half satisfied with existing emphasis. Respondents to the issues requested that the current timber sale program continue with a mix of management emphasis to include other resources. Some offering oral testimony indicated that any alternative placing the area around Skagway in primitive or semi-primitive recreation was acceptable. Others indicated a preference for stopping clearcutting Forest-wide.

Subsistence Use

In 1987, the per capita subsistence harvest in Skagway was 52 edible pounds. About 68 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were halibut and king crab (TRUCS 1989).

Based on edible pounds harvested, salmon at 34 percent, finfish other than salmon at 31 percent and invertebrates at 23 percent are the most important subsistence resources for Skagway households. Deer comprise only 6 percent of the total edible pounds harvested. Skagway hunters travel an average of 155 miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Skagway households have ever used to hunt deer. Summarizing, the majority of Skagway households hunt deer in Wildlife Analysis Areas (WAA's) 3523, 3524, and 4252. As displayed on the Deer Harvest by Community map (in the map packet), these areas are quite a distance from the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 3310 (5 deer), 3836 (5 deer), and 3629 (4 deer) (ADF&G 1994). These WAA's are 7, 4 and 17 accessible by existing roads.

Direct, Indirect, and Cumulative Effects

Skagway has a ferry terminal and provides road access into Interior Alaska and Canada. Recreation, tourism, and subsistence use are important to the community.

Recreation and tourism use is expected to increase by roughly the same amount in all alternatives. This would benefit the retail sales and services sectors of Skagway's economy.

The Socio-economic Panel's assessment for Skagway used in evaluating the effects described above resulted in the following estimated effects on community indicators:

SKAGWAY	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇔
Resource jobs - comm. fishing	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Resource jobs - rec/tourism	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇔
Community stability	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Quality of life	⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇔
Recreation opportunities	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Access to traditional lifestyle	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 88 percent of the total edible pounds of subsistence resources harvest by Skagway households (Kruse and Frazier 1988).

Deer account for only a small fraction of the total edible pounds of subsistence resources harvested by Skagway households (Kruse and Frazier 1988).Table 3-146 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Skagway's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Skagway hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Skagway residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability and all alternatives may have future inadequate habitat capability for the total deer hunted. At some point, a restriction in hunting may be necessary.

Table 3-146. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Skagway residents obtain approximately 75% of their average annual deer harvest

	Average Deer Harvest From 1987-1994		1995 Deer Habitat Capability	Deer Habitat Capability by Alternative at 2095								
WAA*	Skagway Residents	All Hunters		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
3310	5	245	1442	1328	1328	1328	1328	1328	1328	1328	1328	1328
3836	5	336	1592	1592	1592	1592	1592	1592	1592	1153	1254	1052
3629	4	161	1830	1673	1162	1309	1379	1379	1183	1040	1251	1232
4146	2	158	907	908	908	908	908	908	908	908	908	908
4222	2	170	2065	1998	1608	1714	1769	1769	1616	1599	1706	1599
Total	18	1070	7836	7499	6598	6851	6976	6976	6627	6028	6447	6119
% Change in Habitat Capability From 1995:				-4.3	-15.8	-12.6	-11.0	-11.0	-15.4	-23.1	-17.7	-21.9
Skagway Harvest % of 2095 Capability:				0	0	0	0	0	0	0	0	0
Total Harvest % of 2095 Capability:				14.3	16.2	15.6	15.3	15.3	16.1	17.8	16.6	17.5

With little timber harvest activity, Alternative 1 would provide the least effect on Skagway's subsistence uses. A majority of Skagway's use area is within development LUD's in Alternatives 2, 4, 7, and 9 and will likely impact subsistence use with timber harvest activity. Alternatives 5 and 6 allocate portions of Skagway's highest use area in Old Growth Habitat LUD's, offering some habitat maintenance. Alternatives 4 and 5 have longer rotations which would maintain a higher level of older forest within the development LUD's. Recreation LUD's are allocated inland in Alternatives 2, 4, 5, and 6 which would likely increase habitat maintenance in those areas. Alternatives 3, and 8 prescribe additional Old Growth Habitat LUD's within Skagway's high use areas.

As hunters from Skagway travel some distance already, alternatives which may increase access from the ferry system (2 - 9), may decrease their cost of accessing areas to hunt in. But with this additional access would likely come an increase in competition from hunters of other communities. In some cases this competition could cause Skagway hunters to travel farther.

Tenakee Springs

Tenakee Springs is located 50 miles northeast of Sitka on the north shore of Tenakee Inlet (east Chichagof Island). With a population of 100 residents, Tenakee Springs has a 9.6 percent Alaska Native population (ADCRA 1995). Tenakee Springs is accessible only by floatplane or boat, and is a stop on the Alaska Marine Highway ferry line.

An original Tlingit winter village site was located in the vicinity of the present-day harbor and a summer village was located across the Inlet at Kadashan Bay (ADF&G 1994). Early prospectors and fishermen came to the site to wait out the winters and enjoy the natural hot springs in Tenakee. Around 1895, a large tub and building were constructed to provide a warm bathing place. The 108-degree sulfur springs is the social focus of the community, with bathing times scheduled for men and women.

In 1904, E. Snyder bought a tract of land from a Tlingit resident, including a house located near the public bath house. The post office, established in 1903, used the name Tenakee. In 1928, the community's name was changed to Tenakee Springs. The community has a local Fish and Game Advisory Committee, and many residents practice a subsistence lifestyle, actively exchanging resources with neighbors (ADF&G 1994).

Economy

Various salmon and crab canneries operated in the Tenakee region from as early as 1916 until 1974. The Tenakee Springs economy historically centered around the commercial fishing industry, and to a lesser extent included logging. Participation in the commercial fishing industry decreased after the demise of the local canneries, but residents continue to fish commercially (ADF&G 1994).

Logging began at nearby Corner Bay in the early 1970s, and the town has experienced some growth. Logging in the Indian River drainage, directly adjacent to Tenakee, began in the late 1970s and continued intermittently in the 1980s. When logging in the Indian River drainage ended, logging jobs decreased and some residents left Tenakee to find jobs elsewhere in the logging industry. A local sawmill operated off and on until it was destroyed in a 1984 Thanksgiving Day storm. A large fire on July 19, 1993 destroyed part of the town, including the hotel. Tenakee is popular with area people and a favorite stop for boaters. A number of Juneau residents maintain second homes there. The 1989 median household income was $18,125 (ADCRA 1995). Unemployment in 1994 for this census area was 10.6 percent, compared to 8.2 percent throughout Southeast (*Alaska Economic Trends* 4:1995).

Opinions

A number of Tenakee Springs residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Tenakee Springs residents who responded to the issues, and the City of Tenakee Springs, want to see more emphasis placed on scenic resources, recreation, fish, wildlife, and subsistence. They want the current timber sale program reduced, and the long-term sales terminated. They do not feel that jobs should be the reason for making forest-use decisions. Neither respondents nor the City want additional roads, log transfer facilities or connections to existing roads. Respondents indicated that to them more roads means more hunter access and fewer deer. They are opposed to emphasis on mineral exploration and development and favor additional Wilderness designations. They want management to emphasize tourism, wildlife, recreation and subsistence sectors of the economy. Both the City and the Tenakee Fish and Game Advisory Committee, are very concerned with current and projected future declines in wildlife habitat near Tenakee, especially along Tenakee Inlet.

In pursuing traditional subsistence resources, Tenakee Springs residents hunt deer, bear, and seals; catch salmon and other finfish; collect shellfish; and trap furbearers. In 1987, the per capita subsistence harvest in Tenakee Springs was 345 edible pounds. More than 90 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were chinook salmon, halibut, rockfish, deer, seal, dungeness crab, and berries (TRUCS 1989).

Based on edible pounds harvested, deer at 39 percent, finfish other than salmon at 24 percent and invertebrates at 17 percent are the most important subsistence resources for Tenakee Springs households. Tenakee Springs hunters travel an average of seven miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Subsistence Use

Appendix C provides detailed maps regarding the areas that Tenakee Springs households have ever used to hunt deer. Summarizing, the majority of Tenakee Springs households hunt deer in Wildlife Analysis Areas (WAA's) 3526, 3627, and 3628. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 3526 (34 deer), 3629 (15 deer), and 3535 (7 deer) (ADF&G 1994). These WAA's are 33, 17, and 41 accessible by existing roads.

Direct, Indirect, and Cumulative Effects

Tenakee Springs is primarily a commercial fishing, subsistence, and retirement community. The lands along Tenakee Inlet are some of the most important to the community.

Commercial fishing is not expected to be significantly affected by Forest Service activities during the next ten years.

The Socio-economic Panel's assessment for Tenakee Springs used in evaluating the effects described above resulted in the following estimated effects on community indicators:

TENAKEE SPRINGS	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇔	⇑/⇔	⇑/⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇔
Resource jobs - comm. fishing	⇑	⇓/⇔	⇔	⇔	⇔	⇔	⇓	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇑/⇔	⇓/⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔	⇔	⇔
Community stability	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇔
Quality of life	⇑	⇓/⇔	⇓/⇔	⇓/⇔	⇔	⇓/⇔	⇓	⇓/⇔	⇓
Recreation opportunities	⇑	⇓/⇔	⇓/⇔	⇓/⇔	⇔	⇓/⇔	⇓	⇓/⇔	⇓/⇔
Access to traditional lifestyle	⇑	⇓	⇓/⇔	⇔	⇔	⇓/⇔	⇓	⇓/⇔	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 55 percent of the total edible pounds of subsistence resources harvest by Tenakee Springs households (Kruse and Frazier 1988).

Table 3-147 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Tenakee Springs' subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Tenakee Springs hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Tenakee Springs residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability and all alternatives may have future inadequate habitat capability for the total deer hunted. At some point, a restriction in hunting may be necessary, especially for Alternatives 2, 7 and 9 which could be close to 20 percent of deer habitat capability being harvested in the year 2095. Deer account for 39 percent of the total edible pounds of subsistence resources harvested by Tenakee Springs households (Kruse and Frazier 1988).

Table 3-147. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Tenakee Springs residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harves From 1987-1994		1995 Deer Habitat Capability	Deer Habitat Capability by Alternative at 2095								
WAA*	**Tenakee Sp. Residents**	**All Hunters**		**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 7**	**Alt 8**	**Alt 9**
3526	34	166	1180	1180	777	1180	1180	1180	1180	693	940	711
3629	15	161	1706	1673	1162	1309	1379	1379	1183	1040	1251	1232
3525	7	208	2034	2034	1186	2034	2034	2034	2034	1080	1369	1168
Total	56	535	4920	4887	3125	4523	4593	4593	4397	2813	3560	3111

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
% Change in Habitat Capability From 1995:	-0.7	-36.5	-8.1	-6.6	-6.6	-10.6	-42.8	-27.6	-36.8
Tenakee Springs Harvest % of 2095 Capabili	1.1	1.8	1.2	1.2	1.2	1.3	2.0	1.6	1.8
Total Harvest % of 2095 Capability:	10.9	17.1	11.8	11.6	11.6	12.2	19.0	15.0	17.2

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

Kadashan and Trap Bay watersheds are legislated LUD II areas. These areas were designated in the Tongass Timber Reform Act, in part, because of their high value for subsistence use to Tenakee Springs residents. WAA's 3526, and 3525 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. With little timber harvest activity, Alternative 1 would have the least effect on Tenakee Springs' subsistence uses. A majority of Tenakee Springs' use area is within development LUD's in Alternatives 2, 4, 7, and 9 and will likely impact subsistence use with timber harvest activity. Alternatives 5 and 6 allocate portions of Tenakee Springs' highest use area in Old Growth Habitat LUD's, offering some habitat maintenance. Alternatives 4 and 5 have longer rotations which would maintain a higher level of older forest within the development LUD's. Recreation LUD's are allocated inland in Alternatives 2, 4, 5, and 6 which would likely provide better for habitat in those areas. Alternatives 3, and 8 prescribe additional Old Growth Habitat LUD's within Tenakee Springs' high use areas. Long and Seal Bays in Tenakee Inlet, areas considered important for subsistence by local residents, would be available for timber harvest in some alternatives; in the current TLMP they are LUD II.

Thorne Bay

Thorne Bay, a young and rapidly growing city about 40 air miles northwest of Ketchikan, is located at the head of Thorne Bay on eastern Prince of Wales Island. Its population of 633 includes 1.2 percent Alaska Native (ADCRA 1995).

Petroglyphs and other archaeological remains indicate occupation and use of the area by Alaska Natives dating back at least 3,000 years. Post-contact development began in the early 1900s with construction of a saltery on the south shore of Thorne Bay (ADF&G 1994).

In 1960, a floating logging camp was built in Thorne Bay, and in 1962 a shop, barge terminal, log sort year and camp were built to replace facilities at Hollis. Thorne Bay was incorporated as a second class city in 1982 making it one of Alaska's newest cities. Thorne Bay is accessible by road, water or float plane. Three air carriers serve the community with six to ten flights daily, and the Alaska Marine Highway system is accessed by the road system to Hollis (ADF&G 1994).

Economy

Thorne Bay became the hub of Prince of Wales logging activities in 1962, after operations were shifted from nearby Hollis. Although logging was seasonal, many employees chose to remain at Thorne Bay year-round. Road development, completed in 1973, connected Thorne Bay with other major Prince of Wales communities including Craig, Hydaburg, and Klawock and to the ferry terminal at Hollis (ADF&G 1994).

Land disposals and employment opportunities helped spur growth in Thorne Bay in the 1980s. The population nearly doubled between 1980 and 1990 with logging and forest management remaining the mainstay of the economy. Ketchikan Pulp Company and the U.S. Forest Service are among the largest employers. Forestry and wood processing employ the major amount of Thorne Bay's populations with the other major employer being retail trade. Several lodges are nearby. Over 80 percent of the population remains in the community year-round. The community is currently in the process of upgrading its infrastructure to serve the growing economy and year-round community (ADF&G 1994). The 1989 median household income was $39,688 (ADCRA 1995). Unemployment in 1994 in this census area was 12.5, compared to 8.2 throughout Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita subsistence harvest in Thorne Bay was 188 edible pounds. More than 97 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were coho salmon, halibut, rockfish, trout and char, deer, dungeness crab, berries and wood (TRUCS 1989).

Based on edible pounds harvested, finfish other than salmon at 40 percent, salmon at 25 percent and deer at 20 percent are the most important subsistence resources for Thorne Bay households. Thorne Bay hunters travel an average of 18 miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Thorne Bay households have ever used to hunt deer. Summarizing, the majority of Thorne Bay households hunt deer in Wildlife Analysis Areas (WAA's) 1315, 1319, and 1422. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 1319 (139 deer), 1315 (75 deer) and 1422 (31 deer) (ADF&G 1994). These WAA's are 47, 57 and 66 percent accessible by existing roads.

Opinions

A number of Thorne Bay residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Thorne Bay residents are split in their opinion on management of scenic resources. Half want more emphasis on scenic resources while half want less. Thorne Bay residents who responded to the issues want more emphasis on fish and wildlife but think that current emphasis on subsistence is adequate. They are split in their opinion of emphasis on timber harvesting with half wanting the same mix of emphasis and half wanting less timber harvesting. Those responding to the issues indicated they do not want additional road or log transfer facilities. Some want management to emphasize recreation, tourism and fishing sectors of the economy while others want commodity industries emphasized.

Oral or written comments on the DEIS or Supplement generally favored continuing or increasing the timber sale program, many citing its importance to the local economy. The Mayor of Thorne Bay agreed.

Direct, Indirect, and Cumulative Effects

Thorne Bay is primarily a logging community and as such would be directly affected by the amount of logging opportunities on north Prince of Wales Island. The KPC sort yard through which almost all of the long-term timber sale volume is transferred is located in Thorne Bay. Several small timber purchasers, such as Black Bear Logging, are associated with the community

Alternatives 1, 4, 5 and 6 essentially eliminate all intensive timber harvesting on the north end of the island. Although some individual tree selection opportunities will be available, it amounts to less than 2 MMBF in any alternative, and would most likely be purchased by very small operators for products such as music wood or cedar shakes. This volume would probably only be sufficient for small operators such as Black Bear. The operation at the sort yard would likely be closed. The Forest Service associated employment would also decline. The result of the lack of logging opportunities could result in disruption of community stability. Residents who want to remain with the logging industry would either have to relocate or travel to remote logging camps elsewhere during the week for employment. If these individuals choose to relocate, the loss of their income could affect others in the community.

Alternatives 2, 3, 7, 8, and 9 would continue logging opportunities on the north end of the island. This would allow those individuals associated with the logging industry to maintain their existing lifestyle within the community.

The lodges located nearby the community would likely not be affected by any of the alternatives. Recreation and tourism use is projected to increase roughly to the same degree in all alternatives, benefiting these lodges.

There are several small timber operators which produce value added products in Thorne Bay. These value added products include music wood, cabinets and other products. They need relatively low volumes of timber, but of specific species and grades to meet their needs. All alternatives except Alternative 1 would meet their needs.

The Socio-economic Panel's assessment for Thorne Bay used in evaluating the effects described above resulted in the following estimated effects on community indicators:

THORNE BAY	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇔	⇓	⇓	⇓	⇓/⇔	⇑	⇔	⇑/⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇑/⇔	⇔	⇑/⇔	⇔	⇓	⇓/⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇔	⇑/⇔	⇑/⇔	⇑	⇑/⇔	⇓	⇓/⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇓	⇔	⇓/⇔	⇑/⇓	⇑/⇓	⇑/⇔	⇑/⇔	⇔	⇔
Community stability	⇓	⇔	⇓/⇔	⇓/⇔	⇑/⇓	⇔	⇓/⇔	⇔	⇔
Quality of life	⇓	⇔	⇓/⇔	⇓/⇔	⇓	⇓/⇔	⇑/⇔	⇔	⇔
Recreation opportunities	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑	⇑/⇔	⇓/⇔	⇔	⇓/⇔
Access to traditional lifestyle	⇓/⇔	⇔	⇓/⇔	⇓/⇔	⇓	⇔	⇔	⇔	⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 75 percent of the total edible pounds of subsistence resources harvest by Thorne Bay households (Kruse and Frazier 1988).

Table 3-148 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Thorne Bay's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Thorne Bay hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Thorne Bay residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability and all alternatives may have future inadequate habitat capability for the total deer hunted Deer account for 20 percent of the total edible pounds of subsistence resources harvested by Thorne Bay households (Kruse and Frazier 1988).

Table 3-148. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Thorne Bay residents obtain approximately 75% of their average annual deer harvest.

WAA*	Average Deer Harves From 1987-1994: Thorne Bay Residents	Average Deer Harves From 1987-1994: All Hunters	1995 Deer Habitat Capability	Deer Habitat Capability by Alternative at 2095: Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1319	139	299	2364	2364	1536	2364	2364	2364	2364	1374	1757	1373
1315	75	150	2076	1907	1499	1606	1696	1717	1575	1412	1569	1402
1422	31	343	3617	2556	2291	2447	2501	2535	2403	1940	2381	2210
Total	245	792	8057	6827	5326	6417	6560	6616	6342	4726	5707	4985
% Change in Habitat Capability From 1995:				-15.3	-33.9	-20.4	-18.6	-17.9	-21.3	-41.3	-29.2	-38.1
Thorne Bay Harvest % of 2095 Capability:				3.6	4.6	3.8	3.7	3.7	3.9	5.2	4.3	4.9
Total Harvest % of 2095 Capability:				11.6	14.9	12.3	12.1	12.0	12.5	16.8	13.9	15.9

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

WAA 1319 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. Alternative 1 is unlikely to have direct impacts on Thorne Bay's subsistence use with little timber harvest activity occurring. Alternatives 7 and 9 allocate most of Thorne Bay's use area to a development LUD. The timber harvest activity that is likely to occur would directly impact Thorne Bay's subsistence resource. Alternatives 3, and 8 maintain some Old Growth Habitat LUD's within a major portion of Thorne Bay's use area. This may decrease the impacts of continued harvesting on subsistence use. Alternatives 5 and 6 offer a larger area of Old Growth Habitat LUD's within Thorne Bay's highest use area. And Alternatives 2 and 4 maintain some habitat with Natural Setting LUD's, but a majority of Thorne Bay's use area is allocated to development LUD's. Alternatives 4 and 5 also are beneficial to Thorne Bay's subsistence use areas because of the longer timber rotation which better maintains habitat over time.

Thorne Bay is currently competing with other communities in their subsistence use areas and this is likely to continue under all alternatives. Alternatives increasing access by roads due to harvest activity may increase competition from other communities on Prince of Wales Island indirectly impacting Thorne Bay's use. This possible increase in access may also allow Thorne Bay household's to increase the range of their use at a lower cost.

Whale Pass

Whale Pass is a dispersed unincorporated community located on the northeast coast of Prince of Wales Island. The population of 97 residents is 2.7 percent Alaska Native (ADCRA 1995).

Whale Pass was originally established as a logging camp about 1962 by Ketchikan Pulp Company. According to local residents, a float camp there housed loggers and their families for almost 30 years. In 1982, the float camp was removed and many of the logging families left. Others moved to trailer pads on land at the head of the cove. That same year, Whale Pass became the site of a State land sale, which brought renewed population growth and the founding of a homeowners association. The community has been connected to the road system on Prince of Wales Island since 1981. A log transfer station remains on the southwest side of the bay (ADF&G 1994).

Economy

With the influx of homesite owners, the economy of Whale Pass became somewhat less dependent on the logging industry. A recreational lodge, the school, the Alaska Marine Highway System, US Forest Service, commercial fishing, and limited services provided income sources for local residents. Production and consumption of wild resources comprised an additional sector in the local mixed economy. Whale Pass residents have expressed an interest in forming a local Fish and Game Advisory Committee in order to participate more fully in local subsistence, sport, and commercial fisheries and hunting management issues (ADF&G 1994).

Whale Pass is still economically dependent on the logging industry and is connected to several other Prince of Wales Island communities by the Island road system. The 1989 median household income was $49,583 (ADCRA 1995). Unemployment in 1994 for this census area was 12.5 percent, compared to 8.2 percent in all of Southeast (*Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita subsistence harvest in Whale Pass was 186 edible pounds. All households harvested some subsistence resource. Most commonly used (by over 50% of households) were chinook salmon, halibut, trout and char, deer, dungeness crab, clams and cockles, shrimp, berries, and wood (TRUCS 1989).

Based on edible pounds harvested, deer at 27 percent, salmon at 22 percent and finfish other than salmon at 20 percent are the most important subsistence resources for Whale Pass households. Whale Pass hunters travel an average of 10 miles to their most reliable deer hunting areas (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Whale Pass households have ever used to hunt deer. Summarizing, the majority of Whale Pass households hunt deer in Wildlife Analysis Areas (WAA's) 1527, 1528, and 1530. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 1530 (21 deer) and 1319 (4 deer) (ADF&G 1994). These WAA's are 59 and 47 percent accessible by existing roads.

Direct, Indirect, and Cumulative Effects

Whale Pass would primarily be affected by timber harvest levels, the level of karst protection, recreation and tourism levels, and subsistence opportunities.

Some of the individuals in Whale Pass are employed by the timber industry. Alternatives 1, 4, 5 and 6 essentially eliminate all intensive timber harvesting on the north end of the island. Although some individual tree selection opportunities will be available, it amounts to less than 2 MMBF in any alternative, and would most likely be purchased by very small operators for products such as music wood or cedar shakes. The result of the lack of logging opportunities could result in disruption of the community stability. Residents who want to remain with the logging industry would either have to relocate or travel to remote logging camps elsewhere during the week for employment. If these individuals choose to relocate, the loss of their income would affect others in the community.

There are also individuals in Whale Pass who are very concerned about the level of cave and karst protection. Members of several speliological societies derive a portion of their income from cave and karst analysis and exploration in the vicinity. Alternative 9 meets the minimum requirements of the Federal Cave Resource Protection Act. Alternatives 2 and 7 would provide an incrementally higher level of protection by all known significant caves and some recognition of the connection between karst geology and caves. Alternatives 1, 3, 4, 5 and 6 provide the highest level of protection by implementing a forest wide karst vulnerability assessment methodology.

The Whale Pass Resort and a retail store are located in Whale Pass. Both could be impacted by changes in the level of recreation and tourism use. Recreation and tourism use is projected to increase roughly to the same degree in all alternatives thereby benefiting retail trade and the resort. However since Alternatives 1, 4, 5 and 6 result in the essential elimination of logging opportunities on north Prince of Wales, the resulting declines in timber employment could have a ripple effect and reduce retail trade and services employment. This would be especially true during September through May when recreation and tourism use is much lower.

Thorne Island is particularly of concern to subsistence users and the lodge in Whale Pass due to potential visual and wildlife impacts from timber harvesting. Alternative 1 schedules no timber harvest on Thorne Island. Alternatives 2, 3, 4, 5, 6 and 9 all reduce the size and shape of the potential cut units to minimize their visual impact. Alternatives 7 and 8 allow for intensive timber management on Thorne Island.

The Socio-economic Panel's assessment for Whale Pass used in evaluating the effects described above resulted in the following estimated effects on community indicators:

WHALE PASS	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇔	⇓	⇓/⇔	⇓	⇓/⇔	⇑	⇔	⇑/⇔
Resource jobs - comm. fishing	⇑	⇓/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓	⇔	⇓/⇔
Resource jobs - rec/tourism	⇑	⇓/⇔	⇑/⇔	⇑/⇔	⇑	⇑/⇔	⇓	⇔	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇓	⇔	⇓/⇔	⇑	⇑	⇑/⇔	⇓/⇔	⇓/⇔	⇓/⇔
Community stability	⇓	⇔	⇔	⇔	⇑/⇔	⇔	⇓/⇔	⇔	⇔
Quality of life	⇑/⇓	⇔	⇔	⇔	⇑/⇓	⇔	⇓	⇓/⇔	⇓/⇔
Recreation opportunities	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑	⇑/⇔	⇓/⇔	⇓/⇔	⇓/⇔
Access to traditional lifestyle	⇓	⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇔	⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 60 percent of the total edible pounds of subsistence resources harvest by Whale Pass households (Kruse and Frazier 1988).

Table 3-149 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Whale Pass's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Whale Pass hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Whale Pass residents, as well as for all deer hunted within the WAA's. Deer account for 27 percent of the total edible pounds of subsistence resources harvested by Whale Pass households (Kruse and Frazier 1988).

Table 3-149. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Whale Pass residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Whale Pass Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1530	21	152	1427	1427	1067	1427	1427	1427	1427	1003	1130	1015
1319	4	299	2364	2364	1536	2364	2364	2364	2364	1374	1757	1373
1107	3	37	5703	5590	4704	5199	5109	5192	4926	3758	4816	3792
1318	3	201	1213	1213	782	1213	1213	1213	1213	784	838	764
Total	31	689	10707	10594	8089	10203	10113	10196	9930	6919	8541	6944
% Change in Habitat Capability From 1995:				-1.1	-24.5	-4.7	-5.5	-4.8	-7.3	-35.4	-20.2	-35.1
Whale Pass Harvest % of 2095 Capability:				0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.4	0.4
Total Harvest % of 2095 Capability:				6.5	8.5	6.8	6.8	6.8	6.9	10.0	8.1	9.9

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

WAA's 1530, 1319, and 1318 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. Part of Whale Pass' highest use area is allocated as LUD II and will not change in any of the alternatives. Alternative 1 would provide the least effect on Whale Pass' subsistence uses although some timber harvest activity would be likely to occur in their use area. Alternatives 3, 5, 6, and 8 would offer some maintenance of habitat with Old Growth Habitat LUD's within a small portion of Whale Pass' use area. Alternatives 2, 4, 7, and 9 allocate much of Whale Pass' use area to a development LUD. These LUD prescriptions indicate continued or possibly increased timber harvest and possible mining activity which would likely impact Whale Pass use. Alternatives 4 and 5 have longer rotations which would maintain habitat within the development LUD's Whale Pass uses.

Whale Pass is currently competing with other communities in their subsistence use areas and this is likely to continue under all alternatives. Alternatives increasing access by roads due to harvest activity may increase competition from other communities on Prince of Wales Island indirectly impacting Whale Pass' use. This possible increase in access may also allow Whale Pass household's to increase the range of their use at a lower cost.

Wrangell

Wrangell is located on the tip of Wrangell Island, 35 miles southeast of Petersburg. It lies on the Stikine river, an historic trade route to the Canadian interior. It has a population of 2,659, including 20 percent Alaska Native (ADCRA 1995).

Wrangell began as an important Tlingit site primarily because of its proximity to the Stikine River. Wrangell clans held a monopoly of trading rights along the Stikine (SE Chichagof FEIS, p. 3-101). In recent history, Wrangell has flown the flags of three nations, England, Russia, and the United States. The late 19th century saw Wrangell become a supply center for gold miners and prospectors during three gold rushes.

In 1811, the Russians began fur trading with area Tlingits and built a stockade named Redoubt Saint Dionysius in 1834. In 1867, as part of the Alaska Territory, a military post named Fort Wrangell was established. The community continued to grow because of its strategic location as a military fur trading center, and as an outfitter for gold prospectors between 1861 and the 1930s (ADF&G 1994; ADCRA 1995).

Wrangell is incorporated as a home rule municipality, and has maintained its historic cultural diversity. The community has a local Fish and Game Advisory Committee. In a move to emphasize the importance of subsistence, the Wrangell Indian Reorganization Act Council has formed its own local Fish and Game Advisory Committee (ADF&G 1994).

Economy

Today, timber, fishing, and fish processing dominate Wrangell's economy. More than 100 residents fish commercially and for nearly 50 percent of them, it is their major source of income. Tourism is also a growing influence in the area. Timber, however, grew to surpass fishing in economic importance to the community. Then, in 1994, Alaska Pulp Company announced it was closing its large mill which processed forest resources from the area and exported timber products mainly to Japan. Some 225 workers and loggers were employed by the mill. There is now one small mill in the district, sawing spruce, hemlock and cedar (ADF&G 1994).

Unemployment in this census area in 1994 was 9.2, compared to 8.2 in all of Southeast (*Alaska Economic Trends* 4:1995). The 1989 median household income was $37,538 (ADCRA 1995).

Subsistence Use

Wrangell residents hunt deer, bear, moose, and waterfowl; fish for salmon, halibut, and other finfish; and gather shellfish and berries. In 1987, the per capita subsistence harvest in Wrangell was 164 edible pounds. About 80 percent of all households harvested some subsistence resource. Most commonly used (by over 50% of households) were chinook salmon, halibut, dungeness crab, deer and berries. The average Wrangell household derives 23 percent of its meat and fish from subsistence activities (TRUCS 1989).

Appendix C provides detailed maps regarding the areas that Wrangell households have ever used to hunt deer. Summarizing, the majority of Wrangell households hunt deer in Wildlife Analysis Areas (WAA's) 1903, 1904, and 1906. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 1904 (76 deer), 1530 (49 deer), and 1905 (31 deer) (ADF&G 1994). These WAA's are 39, 58, and 53 percent accessible by existing roads.

Opinions

A number of Wrangell residents provided written comment on the issues for the TLMP Revision process and offered and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

Wrangell residents who responded to the issues are split in their opinion on managing for scenic resources with half wanting more emphasis and half wanting the Forest to be managed for both scenic quality and timber harvesting. The City of Wrangell recommended that some areas be cut progressively at a moderate rate rather than heavily at a rapid rate to maintain scenic quality. Individual respondents recommended additional emphasis be placed on recreation, particularly developed sites. The City recommended a mix of management emphasis on recreation and other Forest uses including timber harvesting and mining.

While individual respondents recommended greater emphasis on fisheries, the City believes the current mix of management for fish and timber harvesting is sufficient. Individuals want additional emphasis on wildlife habitat. The City favors the current timber sale program and the long-term contracts. However, residents are split with half wanting the same mix of timber emphasis and half wanting less timber harvesting. The City favors additional roads, log transfer facilities, and connections to existing roads, particularly a connection to Canada. Individual respondents oppose emphasizing mineral exploration and development while the City favors maintaining current management emphasis for mineral exploration and development. Individuals were split between emphasizing timber harvesting, mining, and a mix between these and amenity industries.

Subsequent commentors presented differing opinions. Some want the timber program to be emphasized citing the importance of the timber industry to the community as a whole. They believe Wrangell cannot survive on fishing and tourism alone. Others believe there is already too much emphasis on timber harvesting and that the current program should be reduced.

Direct, Indirect, and Cumulative Effects

Commercial fishing, timber processing, recreation and tourism, and subsistence opportunities are particularly important to Wrangell.

The timber industry will have the largest amount of variation among the alternatives. The sawmill in Wrangell is currently closed. Alternatives 1, 4 and 5 would likely not supply enough timber to re-open the Wrangell mill. Alternative 3 could provide enough timber to partially re-open the mill only if other mills operate at one shift, and timber prices increase. Alternatives 6 and 8 should allow the Wrangell mill to fully open with one shift if all other mills also operate at one shift and timber prices increase. If timber prices do not increase, the mill should only be able to open part time, and, if other operators run at full capacity the Wrangell would likely be unable to open at all. Alternatives 2 and 9 should allow the mill to reopen at historic capacity even with all other mills running at historic capacity. If other sawmills remain open at full capacity, Wrangell could only re-open part time if timber prices increase. Alternative 7 would allow the Wrangell mill to operate near full capacity.

Commercial fisheries employment is not likely to be affected by forest management activities to any significant degree during the next ten years.

Recreation and tourism are also important to the economy of Wrangell. Wrangell is one of the stop-over points for visitors traveling to the Stikine River and the Stikine-LeConte Wilderness. Recreation and tourism use is projected to increase roughly to the same degree in all alternatives, thereby benefiting retail trade in Wrangell. However, since Alternatives 1, 4 and 5 would likely not allow the sawmill to re-open, the resulting declines in timber employment could have a ripple effect and reduce retail trade and services employment. This would be especially true during September through May when recreation and tourism use is much lower.

The most important recreational and subsistence use opportunities for Wrangell residents include the Stikine River, Wrangell Island and Zarembo Island. All alternatives allow for essentially no development in the Stikine River. Alternative 1 maintains all of the other areas in essentially their current condition. Alternatives 2, 3, 4, 5, 6 and 9 allow some timber harvesting on Zarembo and Wrangell Islands but would maintain visual quality objectives along the most sensitive viewsheds. In addition Alternative 3 would provide for some of the remaining large fragmented old-growth blocks under the Old Growth Habitat LUD. Alternative 7 would manage Zarembo and Wrangell Islands for timber production. Alternative 8 would also manage Zarembo and Wrangell Islands for timber production, but would allocate some of the remaining large fragmented old growth blocks to the Old Growth Habitat LUD.

The Socio-economic Panel's assessment for Wrangell used in evaluating the effects described above resulted in the following estimated effects on community indicators:

WRANGELL	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓	⇑/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇑	⇑	⇑/⇔
Resource jobs - comm. fishing	⇑	⇓/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓	⇓/⇔	⇓
Resource jobs - rec/tourism	⇑	⇓/⇔	⇑	⇑	⇑	⇑	⇓/⇔	⇑/⇓	⇓/⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇓	⇔	⇑/⇓	⇑	⇑	⇑	⇑	⇑/⇓	⇑/⇔
Community stability	⇓/⇔	⇓/⇔	⇓	⇓/⇔	⇑/⇓	⇓/⇔	⇑	⇑/⇓	⇑/⇔
Quality of life	⇓	⇔	⇓/⇔	⇑/⇓	⇑/⇓	⇑/⇓	⇑/⇓	⇑/⇓	⇑/⇔
Recreation opportunities	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇓/⇔	⇓/⇔	⇓/⇔
Access to traditional lifestyle	⇑/⇓	⇔	⇑/⇓	⇑/⇓	⇑/⇓	⇑/⇓	⇓	⇓	⇓

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 52 percent of the total edible pounds of subsistence resources harvest by Wrangell households (Kruse and Frazier 1988).

Table 3-150 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Wrangell's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Wrangell hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent, the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Wrangell residents, as well as for all deer hunted within the WAA's. Deer account for 21 percent of the total edible pounds of subsistence resources harvested by Wrangell households (Kruse and Frazier 1988).

Table 3-150. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Wrangell residents obtain approximately 75% of their average annual deer harvest.

	Average Deer Harvest From 1987-1994		1995 Deer	Deer Habitat Capability by Alternative at 2095								
WAA*	Wrangell Residents	All Hunters	Habitat Capability	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
1904	76	63	909	909	394	909	909	909	909	324	422	270
1530	49	161	2035	2035	1067	2035	2035	2035	2035	1003	1130	1015
1905	31	74	3094	2338	1602	1842	1919	1919	1639	1516	1784	1519
1903	22	34	2676	2301	1610	1852	1912	1912	1652	1390	1718	1485
1906	22	23	942	672	646	659	665	665	660	433	604	426
3733	17	121	1813	1813	1813	1813	1813	1813	1813	1813	1813	1813
1910	16	38	3148	3140	3017	3048	3076	3076	3034	2955	3031	2955
1528	10	43	247	247	180	247	247	247	247	178	231	182
Total	243	557	14864	13455	10329	12405	12575	12575	11989	9612	10733	9665
% Change in Habitat Capability From 1995:				-9.5	-30.5	-16.5	-15.4	-15.4	-19.3	-35.3	-27.8	-35.0
Wrangell Harvest % of 2095 Capability:				1.8	2.4	2.0	1.9	1.9	2.0	2.5	2.3	2.5
Total Harvest % of 2095 Capability:				4.1	5.4	4.5	4.4	4.4	4.6	5.8	5.2	5.8

*Within WAA's in bold text, average deer harvest exceeds 10% of the total deer habitat capability. In alternatives 1, 3, 4, 5, and 6, standards and guidelines prescribe that important deer winter range in these WAA's be maintained, so this analysis assumes no further reduction of capability for these WAA's in those alternatives.

WAA's 1904, 1530, and 1528 will have 25 percent of the highest quality deer winter range conserved in Alternatives 1, 3, 4, 5, and 6. Alternative 1 is unlikely to have direct impacts on Wrangell's subsistence use with little timber harvest activity occurring. Alternatives 7 and 9 will likely impact Wrangell's use area within the development LUD's if timber harvesting continues or increases. Alternatives 3 and 8 will provide some habitat maintenance with Old Growth Habitat LUD's. Alternatives 2, 4 and 5 and 6 will provide a small amount of habitat maintenance within recreation LUD's. Alternatives 4 and 5 may also increasing habitat with longer rotations. Only Alternative 1 restricts all of Wrangell's use areas from possible timber activity.

Indirectly, alternatives which offer opportunities for expanding access may increase competition. But because much of Wrangell's hunting already occurs in areas with limited access, it is unlikely that competition in these areas would affect them.

Yakutat

Yakutat is located in the lowlands along the northern Gulf of Alaska, 212 miles northwest of Juneau at the mouth of Yakutat Bay. Its population is 691, 55 percent of whom are Alaska Native (ADCRA 1995).

Yakutat has a diverse cultural history. The original settlers are believed to have been Eyak people from the Copper River area who were conquered by the Tlingits. Yakutat means "the place where the canoes rest."

Intensive contact with European explorers came in the late 1700s when a Russian fur trading company moved into the Yakutat area. By the mid-1800s, foreign traders were well established along the coast. The contemporary town grew up around "the old village" which was established in 1889 by missionaries (ADF&G 1994).

Incorporated as a first-class city in 1948, Yakutat is governed by a mayor and a city council. Recently, a City - Borough was formed with boundaries expanded to include a large section of the Gulf Coast north of Cape Fairweather. Yakutat has a local Fish and Game Advisory Committee. The city is accessible by jet service from Juneau and Anchorage and is bordered by two national parks/preserves: Glacier Bay and Wrangell-Saint Elias (ADF&G 1994).

Economy

In the early 1900s, the Gulf of Alaska was among the richest commercial fishing areas in the state. Southeast Alaska's first standard-gauge railroad was constructed in order to haul building materials from Yakutat to the cannery site and later to transport fish from the nearby Situk and Lost Rivers. Declining fish stocks led to the closure of the cannery in 1970. Fishing and fish processing remain vital sectors of the economy, however, and commercial catches have increased since the mid-1970s (ADF&G 1994).

In addition to commercial fishing, timber harvesting, tourism, outdoor recreation, oil and gas development, and government have contributed to Yakutat's economic development. A number of hunting and fishing guides operate out of Yakutat. Yak-Tat-Kwaan, the local Native corporation, was launched in 1971 (ADF&G 1994). The 1989 median household income was $36,875 (ADCRA 1995). Unemployment in this census area in 1994 was 14.3 percent, compared to 8.2 percent for Southeast Alaska *(Alaska Economic Trends* 4:1995).

Subsistence Use

In 1987, the per capita subsistence harvest in Yakutat was 398 edible pounds, with 95.6 percent of all households harvesting some subsistence resource. Most commonly used (by over 50% of households) were chinook, coho, and sockeye salmon, halibut, hooligan, moose, harbor seal, dungeness crab, clams and cockles, shrimp, scallops, berries, seaweed/kelp, wood (TRUCS 1989). Based on edible pounds harvested, salmon at 54 percent and finfish other than salmon at 19 percent are the most important subsistence resources for Yakutat households (Kruse and Frazier 1988).

Appendix C provides detailed maps regarding the areas that Yakutat households have ever used to hunt deer. Summarizing, the majority of Yakutat households hunt deer in Wildlife Analysis Areas (WAA's) 4042, 4043, and 4054. As displayed on the Deer Harvest by Community map (in the map packet), these areas are close to the community. In terms of the 1987 - 1994 average number of deer harvested, the most successful deer hunting occurred in WAA's 3310 (3 deer) and 4256 (3 deer) (ADF&G 1994). These WAA's are 11 and 0 percent accessible by existing roads. Note, for Yakutat, subsistence harvest of moose is more important than harvest of deer.

Opinions

A number of Yakutat residents provided written comment on the issues for the TLMP Revision process and offered oral and/or written comments during the DEIS or Supplement comment periods. Those who commented were part of a non-random, self-selecting sample. Their comments may not necessarily reflect community opinion.

The City of Yakutat and the Yakutat Fishermen's Association requested that additional emphasis be placed on managing for scenic resources. While the Association is satisfied with current management emphasis on recreation, the City wants additional recreation emphasis. The City and the Yakutat Fish and Game Advisory Committee requested additional emphasis on fish resources. The City, Advisory Committee, and Association all want management to emphasize wildlife. The City and the Advisory Committee want additional emphasis on subsistence while the Fishermen's Association believe that current emphasis is adequate.

The City and the Fishermen's Association want the current timber sale program reduced and the long-term contracts terminated. Community residents were split in their opinion regarding timber harvesting with half wanting the same mix of emphasis and half wanting less timber harvesting. All three organizations requested no additional roads, log transfer facilities, or connections to existing roads. Yakutat is opposed to having the community connected to Canada by road. The City and Fishermen's Association are opposed to emphasizing mineral exploration and development. The City of Yakutat and the Fishermen's Association requested that additional areas be designated as Wilderness and that management emphasize tourism wildlife, recreation, and subsistence economic sectors. Residents are split with some wanting emphasis on recreation, tourism and fishing and others wanting a mix between these and commodity industries.

Direct, Indirect, and Cumulative Effects

Commercial fishing and subsistence are important to Yakutat. Oil exploration may begin again in the Pacific Ocean close to Yakutat. The Yakutat Forelands are some of the community's most important subsistence use areas.

Commercial fishing is not expected to be significantly affected by Forest Service Activities in any alternative.

Sport fishing primarily for salmon, and hunting primarily for moose and brown bear, are popular attractions. Within the limits that the Area can supply these without diminishing subsistence opportunity, these activities are anticipated to increase at the same rate in all alternatives.

The Socio-economic Panel's assessment for Yakutat used in evaluating the effects described above resulted in the following estimated effects on community indicators:

YAKUTAT	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Resource jobs - timber	⇓/⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔
Resource jobs - comm. fishing	⇑/⇔	⇓/⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇔
Resource jobs - rec/tourism	⇑/⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Resource jobs - mining	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Economic structure/diversity	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔	⇔	⇔
Community stability	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Quality of life	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔	⇔	⇔
Recreation opportunities	⇑/⇔	⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇓/⇔	⇔	⇔
Access to traditional lifestyle	⇔	⇔	⇔	⇔	⇔	⇔	⇓/⇔	⇔	⇔

No significant decline in salmon, other finfish, or invertebrate habitat capability is expected from implementation of any alternative. There is some risk of decline in salmon habitat capability over longer periods of time in Alternatives 2-9 (see the fish section of this chapter). These resources account for 82 percent of the total edible pounds of subsistence resources harvest by Yakutat households (Kruse and Frazier 1988).

Moose is more important than deer as a subsistence meat source for Yakutat residents. It is anticipated that moose availability will not be affected by the alternatives.

Deer account for only a small fraction of the total edible pounds of subsistence resources harvested by Yakutat households (Kruse and Frazier 1988).Table 3-151 displays the estimated level of deer habitat capability within the WAA's where 75 percent of Yakutat's subsistence use occurs. The deer habitat capability decreases based on modeling of past and anticipated future harvest activity. The average number of deer harvested is assumed to be constant throughout the analysis. The table shows the number of deer currently harvested by Yakutat hunters as a percent of the estimated year 2095 habitat capability, and the number of deer harvested by all hunters as a percent of the estimated year 2095 deer habitat capability. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success for their effort. At 20 percent the hunter success for their effort may decrease, and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. All alternatives should be able to provide habitat capability for deer hunted by Yakutat residents. However, current deer harvest for all hunters exceeds 10 percent of habitat capability and all alternatives may have future inadequate habitat capability for the total deer hunted. At some point, a restriction in deer hunting may be necessary.

Table 3-151. Estimated effects of alternatives on deer habitat capability and deer harvest opportunity within Wildlife Analysis Areas where Yakutat residents obtain approximately 75% of their average annual deer harvest.

WAA	Average Deer Harvest From 1987-1994: Yakutat Residents	Average Deer Harvest From 1987-1994: All Hunters	1995 Deer Habitat Capability	Deer Habitat Capability by Alternative at 2095: Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
3310	3	245	1331	1328	1328	1328	1328	1328	1328	1328	1328	1328
4256	3	66	781	781	781	781	781	781	781	781	781	781
3308	2	201	3164	2824	2046	2246	2385	2385	2092	1815	2178	1811
3315	2	127	1284	1240	924	1167	1062	1062	943	759	1151	884
Total	10	639	6560	6173	5079	5522	5556	5556	5144	4683	5438	4804
% Change in Habitat Capability From 1995:				-5.899	-22.58	-15.82	-15.31	-15.31	-21.59	-28.61	-17.1	-26.77
Yakutat Harvest % of 2095 Capability:				0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Harvest % of 2095 Capability:				10.4	12.6	11.6	11.5	11.5	12.4	13.6	11.8	13.3

The highest use areas for Yakutat households are within Wilderness and LUD II designations that will not change by alternative. With little harvest activity, Alternative 1 would have the least effect on Yakutat's subsistence uses outside Wilderness and LUD II. Alternatives 7 and 9 could impact subsistence uses with timber harvest activity within development LUD's. Alternatives 2, 3, 4, 5, 6 and 8 allocate portions of Yakutat's use area in recreation LUD's, offering some habitat maintenance. Alternatives 4 and 5 have longer rotations which would maintain a level of older forest within the development LUD's. Alternatives 3, and 8 prescribe additional Old Growth Habitat LUD's within Yakutat's use areas.

Hunters from Yakutat already travel long distances for access to deer hunting. Alternatives which may increase access from the ferry system may decrease their cost of hunting. But with this additional access would likely come an increase in competition from hunters of other communities. In some cases this competition could cause Yakutat hunters to travel farther. But in their highest use areas, competition may not increase because access is already limited and unlikely to expand.

Chapter 4
List of Preparers

Chapter 4

List of Preparers

This list of preparers contains those people who have been involved in preparing the Revised Supplement to the Draft Environmental Impact Statement. Please refer to the Supplement to the Draft EIS for those people involved before the RSDEIS. In addition, many people who were involved in reviewing documents, updating the database, or verifying information, were essential to the process, but were not directly involved in writing the document, so are not listed here.

Beth A. Giron Pendleton TLMP Co-Team Leader

Contributions made

Responsible for the public participation and coordination of activities leading to the Revision of the Tongass National Forest Land Management Plan.

Education

B.S. Wildlife Biology, University of Vermont
M.S. Wildlife and Fisheries Sciences, South Dakota State University
M.A. Journalism and Communications, University of Wyoming

Forest Service: 6 years

TLMP Co-team leader, 1995-present
Planning Staff Manager, Wildlife, Fish, and Rare Plants Staff, Forest Service National Headquarters, 1992-1995
Program and Partnership Manager, Wildlife, Fish, and Rare Plants Staff, Forest Service National Headquarters, 1991-1992

Robert L. Vaught TLMP Co-Team Leader/Deputy Forest Supervisor, Ketchikan Area

Contributions made

TLMP Co-Team Leader Aug. 1994 - Dec. 1995 TLMP Policy Group Co-Leader Sept. 1995 - April 1996

Education

B.S. Fisheries Biology, University of Alaska Fairbanks

Forest Service: 18 years

Deputy Forest Supervisor, Tongass NF, Ketchikan Area
District Ranger, Intermountain Region
Various district staff positions responsible for Recreation, Lands, Fisheries and Wildlife

4 List of Preparers

Steven Kessler — TLMP Co-Team Manager, Assistant IDT Leader, Fish Biologist

Contributions made

- Member of Leadership Team managing the Revision process
- Member of the Fish Habitat Analysis Team of the Alaska Anadromous Fish Habitat Assessment
- Summarized fish habitat situation on the Tongass, and evaluated consequences of the alternatives on fish. Participated in the development of the Forest-wide GIS database. Coordinated development of Land Use Prescriptions, Forest-wide Standards and Guidelines, and Monitoring Plan. Managed public scoping database, and analyzed public comments.

Education

- B.S. Biological Sciences, University of Arizona, 1974 M.S. Ecology and Evolutionary Biology, University of Arizona, 1978

Forest Service: 16 years

- TLMP Co-Team Manager, 9/95-present
- Assistant TLMP Co-Team Manager and Fish Biologist 1994-1995
- Assistant TLMP Leader and Fish Biologist 1992-1994
- Fish Biologist, Tongass NF, Tongass Forest Plan Revision Interdisciplinary Team, Juneau, Alaska, 1987-1992
- Forest Fish Biologist, Wenatchee National Forest, 4 years
- Fish Biologist, Tongass National Forest, Chatham Area, Juneau Ranger District, Yakutat Work Center, 2 years
- Fish Biologist, Tongass National Forest, Chatham Area SO, 1 year

Other relevant employment

- Planner, Alaska Department of Fish and Game, FRED Division (on IPA assignment from Forest Service to ADF&G), 1982
- Fish Technician, USDI, Bureau of Land Management, Boise, Idaho, Summer 1979
- Hydrology Technician, USDI Bureau of Land Management, Worland, Wyoming, Summer 1978
- Research and Teaching Assistant, University of Arizona, 1975-1978
- Instructor, Pima Community College, Tucson, Arizona, 1977-79

Steven A. Brink — TLMP Team Leader 2/89-9/95, Co-Team Manager 8/94-9/95

Contributions made

- Responsible for the public participation and coordination activities required, and the preparation of the Environmental Impact Statement and other associated documents, leading to the Revision of the Tongass National Forest Land Management Plan. Responsible for consistency with NFMA and NEPA and other applicable laws and regulations.

Education
B.S. Civil Engineering, University of California, Davis 1971

Forest Service: 25 years
Deputy Director of Timber Management, Alaska Regional Office (9/95-present)
Land Management Planning, Regional Office, Juneau, AK, 5 years
Land Management Planning and Transportation Engineering Staffs, Washington, D.C., 1 year
Transportation Engineering Staff, Regional Office, San Francisco, CA, 2 years
Engineering and Aviation Management Staff Officer, Chatham Area, Tongass NF, 4 years
Logging Systems Specialist, Stanislaus NF, 3 years
Transportation Planner, Six Rivers NF, 4 years
Sanitation Engineer, Inyo NF, 1 year
Transportation Engineer, Eldorado NF, 5 years

Robert C. Aiken — Transportation Planner

Contributions made
Coordinated transportation and facilities input, including log haul costs, future road density estimates, log transfer facility inventory, and facility needs

Education
B.S. Forest Engineering, Oregon State University, 1980

Forest Service: 15 years
Transportation Planner, Tongass National Forest, Stikine Area, 1984-present
Forester, Siuslaw National Forest, 1980-84

Other relevant employment
Cooperative Education Student, Siuslaw National Forest, 2 years
Forestry Aid, Siskiyou National Forest, 2 seasons

Debbie Anderson — TLMP Secretary

Contributions made
Word processing
Planning Record/Datalib entry

Education
B.S. Occupational Therapy, University of Kansas, 1969
M.A. Elementary Education, UAS-Juneau, 1990

Forest Service: 7.5 years
Secretary, TLMP Revision IDT, Sept. 1991 to present
Secretary, Forestry Sciences Lab, Juneau
Clerk, Personnel and Planning Units, Regional Office, Juneau, AK

4 List of Preparers

Anne F. Archie — District Ranger, Thorne Bay Ranger District

Contributions made
- Review of Standards and Guidelines
- Coordination with the Ketchikan Area

Education
- B.S. Biological Sciences, Oklahoma State University
- M.S. Natural Sciences, Oklahoma State University

Forest Service: 18 years

David Arrasmith — Economist/Analyst, Planning Staff Officer, Ketchikan Area

Contributions made
- Socioeconomic analysis
- Coordination of TLMP planning with the Ketchikan Area
- FORPLAN analysis

Education
- B.S. Agricultural Economics, University of California Davis, 1981

Forest Service: 13 years
- Planning Staff Officer, Ketchikan Area, 3 years
- Spotted Owl EIS Team, Portland, Or., 1 year
- Economist/Analyst Alaska Region, 2 years
- Economist/Sociologist Eldorado National Forest, 7 years

John T. Autrey — Archaeologist

Contributions made
- Heritage Resource Management

Education
- A.B. Major: Anthropology, Minor: Geography, University of Northern Colorado,3/10/1973
- A.M. Major: Social Science: Anthropology, University of Northern Colorado, 12/8/1973

Forest Service: 12 years
- Ketchikan Area, Tongass National Forest, Area Archaeologist, 1987-Present
- Kaibab National Forest, Assistant Forest Archaeologist, 3 years
- Chatham Area, Tongass National Forest, Archaeological Technician, 2 years

James F. Baichtal — Forest Geologist

Contributions made
- Blue River Lava Flow and North Prince of Wales and Dall Island Karst Special Areas and Standard and Guidelines for Cave Resource Management.

Education

Associate Science Degree, LCC, Longview, WA, 1977
Bachelor of Science in Geology, Washington State University, 1980
Master of Science in Geology, Washington State University, 1982
Thesis topic: Geology of Waldron, Bare, and Skipjack Islands, San Juan County, Washington.

Forest Service: 8 years

Forest Geologist, Ketchikan Area, Tongass National Forest, July 1990-Present
Cave resources in Central Oregon on the Deschutes National Forest.
Member, National Speleological Society and the Glacier Grotto in Alaska.
Resource Geologist, Umpqua NF, Roseburg, OR, 2.5 years
Engineering Geologist, Ochoco NF, Prineville, OR, 3.5+ years
Engineering Geologist, U.S. Army Corps of Engineers, Ft. Worth, TX, 1.5 years
Physical Science Aid, Snoqualmie NF, Naches, WA, summers of 1978/79.
Instructor, Geology, Local Community Colleges.
Instructor, geology field camp, two summers for Paleontology Lab, Washington State University
Detail White Sands Missile Range for 6 weeks in 1986 to the COE to head up a large drilling foundation investigation.
Detailed to the Wallowa-Whitman NF for 2 weeks in 1987 to head Forest personnel with rock source management and foundation design for a boat landing in Hells Canyon.

Other relevant employment

Operated a Geologic Consulting business in and around Roseburg, Oregon.

Michael Condon — Planning Staff Officer, Stikine Area

Contributions made

Coordination of TLMP planning with the Stikine Area

Education

B.S Business Administration/Economics
Graduate study in Forestry and Business Administration

Forest Service: 21 years

Fire Management
Land Management Planning

John Day — FORPLAN Analyst

Contributions made

FORPLAN modeling
FORPLAN analysis

Education

B.S. Forest Management, Colorado State University
M.S. Operations Research/Forestry, Colorado State University

Forest Service: 7.5 years

FORPLAN analyst, TLMP Revision IDT, 5.5 years
TM/LMP Systems Section, Washington Office (Detached), Ft. Collins, Colorado, 2 years

Eugene J. DeGayner — Wildlife Biologist/Resource Information Manager

Contributions made

Wildlife analysis
Coordinate GIS activities
Oversee the development of a forest-wide data base for the Revision

Education

B.S. Wildlife Biology, University of Minnesota, 1980
M.S. Wildlife Biology, University of Minnesota, 1982

Forest Service: 10 years

Regional Wildlife Ecologist, 1995-present
Forest Wildlife Biologist, Tongass NF, Stikine Area, 9/92 to 1995

Wildlife Biologist, Tongass National Forest, Ketchikan Area, 6 years

Ronald L. Dunlap — Fish Biologist

Contributions made

Fisheries Analysis

Education

B.S. Fish and Wildlife Management, Michigan State University

M.S. Biology, Michigan Technological University

Forest Service: 17 years

Fish Biologist, TLMP Revision
Assistant Regional Fisheries Program Manager, Alaska Region
Forest Fish Biologist, Huron-Manistee NF
Forest Fish Biologist, George Washington NF
District Biologist, Kenton Ranger District, Ottawa NF

Pamela J. Finney — Public Affairs Specialist

Contributions made

Develop, implement, and evaluate two-way strategic communication programs that inform and involve people, including groups, government agencies, and all interested public in the Tongass Land Management Plan. Serve as Media specialist for team. Produce public information on the planning process, decision-making, and effects of alternative management activities.

Education

B.S. Forestry and Communication, Oregon State University, 1974

Forest Service: 19 years

Public Affairs Specialist, TLMP team 1995-present
Public Affairs Specialist, National Headquarters of Forest Service 1991-1995
Public Affairs Specialist, Alaska Regional Office 1988-1991
Visitor Center Director, Juneau Ranger District 1985-1988
Interpreter/Information Specialist, Juneau Ranger District 1981-1985
Public Information Officer, Mt. Hood National Forest, Oregon 1979-1980
Forest Interpreter, Alaska Region 4 years

Gary Fisher — Resource Information Manager

Contributions made

GIS analysis and map production

Education

B.S. Forest Management, Northern Arizona University
M.S. Forest Information Systems, University of Minnesota

Forest Service: 4.5 years

Other relevant employment

Private industry timber scaler and cruiser, 3.5 years
Independent forestry contractor/consultant, 3 years

Donald K. Golnick — Forester

Contributions made

Timber Analysis

Education

B.S. Forestry (Hydrology emphasis) University of Minnesota, 1973
Forest Engineering Institute, Oregon State University, 1977
Forest Ecology and Silviculture (CEFES VII), University of Montana, University of Idaho, and Washington State University, 1985

Forest Service: 20 years

Certified Silviculturist, Alaska Region (pending)
Certified Silviculturist, Plumas National Forest, 11 years
Timber Management Assistant, Six Rivers National Forest, 2 years
Timber Sale Planner, Six Rivers National Forest, 2 years

Rick Griffen — Resource Information Manager - GIS

Contributions made

Maintenance of the TLMP information database
Systems Manager for the RISC-based computer system

GIS database management and analysis

Education
B.S., M.S. Wildlife Management; Humboldt State University, 1983

Forest Service: 10 years
TLMP Revision IDT, 1989 - present
Sitka Supervisor's Office, Tongass NF, 1.5 years
Hoonah Ranger District, Tongass NF, .5 year

Paul E. Hennon — Forest Pathologist

Contributions made
Prepared sections on forest health

Education
Ph.D. Botany and Plant Pathology Department, Oregon State University

Forest Service: 16 years
Investigating yellow-cedar decline
Ecology and management of heart rots and dwarf mistletoe

Lynn L. Humphrey — Recreation Planner

Contributions made
Recreation and Tourism Analysis
Roadless Area Analysis
Wild and Scenic Rivers Analysis

Education
B.S. Forest Biology, Colorado State University, 1979

Forest Service: 16 years
Recreation Planner, Tongass NF, 1992-present
Lands, Minerals, Timber, Recreation Specialist, Juneau Ranger District, 1986-1991
Computer Programmer Analyst, Alaska Regional Office, 1984-1986
Computer Programmer, Southern Forest Experiment Station, 1981-1984
Inventory Forester, Southern Forest Experiment Station, 1979-1981

Chris Iverson — Wildlife Ecologist

Contributions made
Wildlife and Viability Issues including:
Coordinated species assessments and workshops
Facilitated Viability panel assessments
Prepared wildlife resource analyses

Education
B.S. Biology (minor chemistry), Central Michigan University, 1977
M.S. Wildlife Ecology, Oklahoma State University, 1981

Relevant Work Experience
- Wildlife Ecologist, Tongass Land Management Planning Team, 1995-present
- Regional Ecology Program Leader, 1992-Present
- Forest Wildlife Biologist, Stikine Area, Tongass National Forest, 1989-1991
- Nongame and Endangered Species Coordinator, Indiana Dept. of Natural Resources, 1981-1988

John Morrell — Lands Specialist

Contributions made
- Lands analysis
- Law enforcement input

Education
- B.S. Forestry, University of Montana, Missoula, 1967
- M.S. Forestry, California State University, Humboldt, 1976
- Master of Forest Resources, University of Washington, 1977

Forest Service: 17 years
- Lands Forester, Tongass NF, Chatham Area, 7 years
- Resource Assistant, Thorne Bay RD, 2 years
- Resource Assistant, North Prince of Wales RD, 2 years
- Forester/Recreation Assistant, Packwood RD, 2 years
- Forester, Packwood RD, 1 year
- Forestry Technician, Packwood RD, 3 months

Other relevant employment
- Research Assistant, University of Washington/PNW Experiment Station, 1.5 years
- Recreation Technician, BLM, Ukiah, CA, 3 months

Bruce Rene — Natural Resource Planner

Contributions made
- Provide guidance on and facilitate: 1) the documentation of the National Forest Management Act planning process, and 2) the analysis and documentation required by the National Environmental Policy Act

Education
- B.A., Humanities, Shimer College 1967
- M.A., English, University of Kentucky, 1970
- MBA, Business Administration, University of Texas, 1976

Forest Service: 17 years
- Documents Coordinator, 5 years
- Assistant Forest Planner & Environmental Coordinator, Stanislaus NF, 11 years

4 List of Preparers

Guy C. Robertson — Economist

Contributions made

- Analysis of economic outputs associated with Tongass National Forest resource dependent industries (timber, recreation, commercial fishing and mining)
- Economic impact analysis of alternative upon employment and income in S.E. Alaska.
- Economic efficiency analysis of alternatives using net present value accounting

Education

- Currently enrolled, College of Forest Resources Ph.D. program in Forest Economics, University of Washington, Seattle, Washington (9/92-present).
- Monbusho (Japan Ministry of Education) Scholar, Department of Forestry, Tokyo University of Agriculture and Technology, Tokyo, Japan. (1/92-8/92).
- Japan Regional M.A. Program, Jackson School of International Studies, University of Washington, Seattle, Washington (9/88-4/91). MA degree received June, 1991.
- Carleton College, Northfield, Minnesota. Bachelor of Arts degree in philosophy received June, 1983.

Forest Service: 1 year

- Research Economist, PNW Research Station, Seattle Lab, USDA Forest Service (10/95-present).
- Research Economist, PNW Research Station, Seattle Lab, USDA Forest Service (6/95-9/95).
- Research Assistant, Center for International Trade in Forest Products (CINTRAFOR), College of Forest Resources, University of Washington, Seattle, Washington (9/92-6/94, 9/94-6/95).
- Assistant Economic Analyst, PNW Research Station, Seattle Lab, USDA Forest Service (6/94-9/94).

Other relevant employment

- Occasional Consulting for the Japan Wood Products Research Center, Seattle Office (3/95-present).
- Researcher/Translator, Comline International News Service, Tokyo, Japan (6/91-8/92 [1/92-8/92 half-time]).
- English Instructor, CECIL International, Kokura, Japan (7/85-8/88).

Julie Schaefers — Economist/GIS analyst

Contributions made

- Coordination of the Socio-economic affected environment and effects analysis
- GIS analysis for recreation, roadless, visuals and publication of the map packet.

Education

- B.S. Forest Recreation Resources, Oregon State University, 1989.
- M.S. Agriculture and Resource Economics, Colorado State University, 1994.

Forest Service: 8 years
- TLMP Economist and GIS analyst
- Cooperative Education Student on Willamette NF
- Various Ranger District assignments

John C. Sherrod — Planning Staff Officer, Chatham Area

Contributions made
- Coordination of the TLMP planning with the Chatham Area
- Task force for development of the Forest Monitoring Plan
- Assisted IDT in formulating procedures and processes.
- Assisted in conducting public hearings and open-houses

Education
- B.S. Forestry, University of Georgia, 1960
- M.S. Forest Resources, University of Idaho, 1980

Forest Service: 33 years
- Planning Staff Officer on the Tongass, Chugach, and Helena National Forests, 17 years
- Planning Team Leader on the Willamette, Gallatin, and Custer National Forests, 6 years
- Ranger District assignments on four Districts on the Custer and Colville National Forests, 10 years

John Short — Forest Landscape Architect, Ketchikan Area

Contributions made
- Scenery affected environment and effects analysis
- Directed and helped implement recreation place, recreation site, and trail inventory, and directed its input into ARC/INFO data base.
- Implemented visual resource inventory for Ketchikan Area and directed its input into ARC/INFO data base.
- Assisted in developing Roadless inventory and Roadless Area descriptions.
- Assisted in revising Roadless chapter for supplemental draft.

Education
- B.S., Journalism, minor in Landscape Architecture, Cornell University, 1967
- M.L.A, Landscape Architecture, Cornell University, 1975

Forest Service: 15 years
- Forest Landscape Architect, Ketchikan Area. Involved in visual resource management, timber sale planning, visual and recreation inventories, recreation planning, recreation site planning, accessibility coordination.

Other relevant employment
- Landscape architect, City Planning Department, Ithaca, NY, 1975, 6 months

4 List of Preparers

Annette Untalasco — Computer Specialist

Contributions made
Formatting and editing of document

Education
B.S. Environmental Health, 1975

Work experience
various clerical/administrative

Carole Lee Walk — Administrative Assistant for Research

Contributions made
Administrative support

Education
B.S., Education, Drake University

Forest Service 6 years
Administrative Assistant, TLMP Revision
Business Management Assistant, Juneau Ranger District
Secretary, Washington Office

Bill Wilson — Timber Planner

Contributions made
Timber analysis

Education
B.S. Forestry, McNeese State University, 1968

Forest Service: 26 Years
Group Leader, Silviculture, Inventory, and Plans, Alaska Region
Revision IDT Member, Tongass National Forest, (1987-5/89)
Regional Office Timber Planner, Alaska Region, 8 years
District and Supervisors Office Timber Assistant, Lincoln NF, 3 years
District Timber Assistant, Kiabab NF, 1 year
Supervisors Office Timber Assistant, Prescott NF, 4 years
Inventory Forester, Southern Forest Experiment Station, 3 years
Forestry Aid, Mt. Hood NF, 1 year

The following individuals with the Forest Service Pacific Northwest Research Station did not actually prepare the document, but located, assembled, analyzed, and interpreted scientific information that was made available for use in the Forest Plan and RSDEIS.

Fred Everest — TLMP Co-Policy Group Leader

Contributions made
- Co-lead Policy Group
- Fisheries Analysis

Education
- B.S. and M.S. Fisheries Science, Humboldt State University
- Ph.D. Forest Sciences (fisheries specialty), University of Idaho, 1969

Forest Service
- Pacific Northwest Research Station, 1977-present
- Siskiyou National Forest, 1972-1977

Doug Swanston — TLMP Co-Team Leader

Contributions made
- Co-managed science team
- Karst and cave analysis

Education
- Ph.D. Michigan State University

Forest Sevice
- Team Leader for Watershed Management Research in coastal Alaska, Pacific Northwest Research Station
- Research Geologist, Pacific Northwest Research Station. Dr. Swanston has over 70 publications to his credit relating to landslide problems and land management concerns.

Charles G. "Terry" Shaw III — TLMP Co-Team Manager for Research

Contributions made
- Manage science input to the Revision, including assessments and panels. Will be responsible for publication of science documents

Education
- B.S.C. Forestry, Washington State University, 1970
- Ph.D. Plant Pathology, Oregon State University, 1974

Forest Service
- Research Plant Pathologist for Pacific Northwest Research Station, 1977-1986
- Project Leader for Rocky Mountain Research Station project on Pest Impact Assessment Technology. This project was west-wide in the Forest Service and provided input on how to best incorporate information on pest impact into forest plans. Dr. Shaw has some 50 published papers dealing with forest conditions in Southeast Alaska.

4 List of Preparers

Guy Cellier — Social Scientist

Contributions made
- Socio-economic and subsistence analysis

Education
- B.S. Forestry, University or Stellenbosch, South Africa, 1981
- M.S. Forest Resources, University of Washington, 1987
- Ph.D. Human Geography, University of Natal, South Africa, 1994

Relevant Work Experience
- Social Scientist, Tongass Land Management Planning Team, 1995-1996
- Development Manager, Mondi Forests, South Africa, 1990-1994
- Fibre Resources Analyst, Mondi Paper Co., Ltd., Johannesburg, 1989-1990
- Senior Lecturer, Land Use Planning , University of Fort Hare, South Africa, 1989
- Research Assistant, University of Washington, 1986-1988
- Consultant, Washington Department of Natural Resources, 1987
- Planning Forester, Lotzaba Forests Ltd., Tzaneen, South Africa, 1983-1985

John Caouette — Statistician

Contributions made
- Participated in the development of a statistically defensible TIMTYP map.

Education
- B.S. Mathematics, University of Minnesota, 1987
- M.S. Applied Mathematics and Statistics, University of Minnesota, Duluth, 1994

Forest Service, 2 years
- Statistician, Forestry Sciences Lab, 1 year.
- Forestry Technician, Forestry Sciences Lab, 1 year.

Other relevant employment
- Research Assistant, Natural Resources Research Institute, Duluth, Minnesota, 1 year

Kent Julin — Research Forest Ecologist

Contributions made
- Timtyp map
- Forested Wetlands
- Monitoring Plan

Education
- B.S. Forest Resources Management, Humboldt State University, 1981.
- M.S. Forest Ecology, University of Washington, 1981.
- Ph.D. Forest Ecology, University of Washington, 1988.

Forest Service

Research Forest Ecologist, PNW Station, 1995 - present
Forestry Aide, Shasta NF, 1979-1980
Forestry Technician, Klamath NF, 1978

Other relevant work experience

Senior Environmental Scientist, Harding Lawson Associates, 1989-1995
Research/teaching assistant, College of Forest Resources, University of Washington, 1984-1988.

Winston P. Smith Research Wildlife Biologist

Education

B.S. and M.S. in zoology from Louisiana State University, 1971 and 1976, respectively.
Ph.D. in wildlife ecology and zoology, Oregon State University, 1982.

Contributions made

Review of wildlife habitat capability models
Defined new beach fringe buffer requirements for bald eagles on the Tongass
Organization, implementation and evaluation of wildlife risk assessment panels
Assisted with Old Growth block inventory
Participated in wildlife viablity synthesis workshop

Forest Service

1989-1995 Supervisory Research Wildlife Biologist, Southern Research Station. Wildlife habitat relationships at multiple in bottomland hardwood forests with emphasis recently on neotropical migratory birds
Team leader of multi-disciplinary research focusing on components and processes in natural regeneration of BLH forests with empahsis on effects of herbivory by white-tailed deer and swamp rabbits on hardwood seedling regeneration and diversity of herbaceous and woody vegetation
Cooperative research with Louisiana State and Mississippi State University on Louisiana black bear habitat needs and multiple spatial scales. Lousisiana black bear is federally listed threatened species.

Other relevant employment

Research on habitat relationships of several TES species including red-cockaded woodpecker, Mississippi sandhill crane, and Columbian white-tailed deer.
Served on endangered species recovery team; co-authored revision of Columbian white-tailed deer recovery plan which included the first viability analysis of endangered species.
Consultation with ADF&G in the early 1980s related to designing studies to examine Sitka black-tailed deer habitat relationships on the Tongass National Forest

4 List of Preparers

Other Federal Agency personnel assigned to TLMP team

Chris Meade

Environmental Scientist, U.S. Environmental Protection Agency

Contributions made

Environmental review, fish habitat and water quality, Monitoring and Evaluation Plan

Education

Forestry major, Paul Smiths College, 1979-81
B.S. in Natural Resources Management, University of Alaska-Fairbanks, 1981-85
Master of Public Administration, University of Alaska-Anchorage, 1986-87

Relevant Work Experience

U.S. Environmental Protection Agency, 1990-present
U.S. Peace Corps, Sapo National Park, Liberia, 1987-89

Chapter 5
Mailing List

Chapter 5

Mailing List

The list of agencies, organizations, and individuals to whom copies of the Revised Supplement are being sent was still being compiled at the time of publication of this document. The list is available upon request from the Forest Plan Revision Team, 8465 Old Dairy Road, Juneau, Alaska 99801.

Chapter 6
References

Chapter 6

References

Alaback, P. B. 1984. Plant Succession Following Logging in the Sitka Spruce-Western Hemlock Forests of Southeast Alaska: Implications for Management. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. General Technical Report PNW-173.

Alaback, P. B. 1982. Forest Community Structural Changes During Secondary Succession in Southeast Alaska. In: USDA Forest Service, Forest Succession and Stand Development Research in the Northwest: Proceedings of the Symposium March 26, 1981, p. 70-79. Corvallis, OR.

Alaska Department of Community and Regional Affairs. 1995. DCRA Community Database. Juneau, Alaska.

Alaska Department of Fish and Game. 1994. Subsistence Resource Use Patterns in Southeast Alaska: Summaries of 30 Communities. [one per community]

Alaska Department of Labor. 1995. Alaska Economic Trends. Research and Analysis Section.

Aley, T., et al. 1993. Karst and Cave Resource Significance Assessment, Ketchikan Area, Tongass National Forest, Alaska. Ozark Underground Laboratory. Protem, Missouri.

Anderson, M. C. and D. Mahato. 1995. Demographic Models and Reserve Designs for the California Spotted Owl. Ecological Applications 5:639-647.

Aulerich, D. E., William S. Koenitzer, John C. Tappeiner, J. Douglas Brodie, and Mark D. Schaaf, 1982. Alaskan Silvicultural Analysis, Precommercial Thinning, Task 12B. Prepared under contract for the USDA Forest Service, Region 10, Juneau, Alaska. Contract #53-0109-1-00088.

Beattie, M. H. 1995. Endangered and Threatened Wildlife and Plants; 12-Month Finding for a Petition to List the Queen Charlotte Goshawk as Endangered. USDI, Fish and Wildlife Service. Federal Register 60(125):33784-33785.

Bissonette , J. A., R. J. Fredrickson, and B. J. Tucker. 1989. American Marten: A Case for Landscape-level Management. Trans. North Am. Wildl. and Nat. Resour. Conf. 54:89-101.

Bormann, B. T., H. Spaltenstein, M. H. McClellan, F. C. Ugolini, K. Cromack Jr., and S. M. Nay. 1985. Rapid Soil Development After Windthrow Disturbance in Pristine Forests. Journal of Ecology 83:747-757.

Capp, J., B. Vaught, J. Christner, J. Mckibben, F. Samson, and C. Iverson. 1991. Committee Report, Steering Committee for Viable Population Review. USDA Forest Service, unpubl. report. Juneau, AK.

Capp, J. C. 1996. Foundation Policy Statements for Forest Service Actions: Prevent the Need to

6 References

List Species Under the Endangered Species Act. Forest Service Region 10. Juneau, Alaska.

Cellier, G. and K. Morse. 1995. Socioeconomic Effects Analysis Concept Proposal and Draft "Affected Environment" writeups for 30 communities. Tongass Land Management Planning Team. Juneau, Alaska.

Childs, T. W. and K. R. Shea. 1967. Annual Losses From Disease in Pacific Northwest Forests. USDA Forest Service, Pacific Northwest Research Station, Resource Bulletin PNW-20.

City of Wrangell. 1995. Overall Economic Development Plan. Wrangell, Alaska.

Concannon, J. A. 1995. Characterizing Structure, Microclimate, and Decomposition of Peatland, Beachfront, and Newly-logged Forest Edges in Southeastern Alaska. Univ. of Wash. Seattle, WA.

Cook, J. A. 1996. February 1 letter to Doug Swanston (TLMP-FSL) Reporting preliminary laboratory results of genetic analysis of flying squirrel specimens. University of Alaska Museum. Fairbanks, AK.

DellaSala, D. A., K. A. Engel, D. P. Volsen and R. L. Fairbanks. Effectiveness of Silvicultural Modifications of Young-Growth Forest For Enhancing Wildlife Habitat on the Tongass National Forest, Southeast Alaska. Final Report. Prepared under contract for the USDA Forest Service, Region 10. Juneau, Alaska.

Farr, W. A. and A. S. Harris. 1971. Partial Cutting of Western Hemlock and Sitka Spruce in Southeast Alaska. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. Research Paper PNW-124.

Farr, W. A. and M. H. McClellan. 1994. Size and Age Structure of Trees in the Old-Growth Forests of Southeast Alaska. USDA Forest Service, Pacific Northwest Research Station. Draft manuscript on file at Juneau Forestry Sciences Laboratory, Juneau, AK.

Farr, W. A.. 1984. Site Index and Height Growth Curves for Unmanaged Even-Aged Stands of Western Hemlock and Sitka Spruce in Southeast Alaska. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. Research Paper PNW-326.

Farr, W. A., V. J. LaBau and T. H. Laurent. 1976. Estimation of Decay in Old-Growth Western Hemlock and Sitka Spruce in Southeast Alaska. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Research Paper PNW-204.

Flynn, R. W. 1994. A Strategy for Maintaining Well-distributed, Viable Marten Populations in Southeast Alaska. Unpubl. Draft Rep. Alaska Dept. Of Fish and Game.

Flynn, R. W. 1995. Revised Marten Habitat Capability Model Coefficients. November ADF&G Letter to C. Iverson, TLMP, IDT.

Franklin, J. F. 1992. Preserving Biodiversity: Species, Ecosystems, or Landscapes? Ecological Applications 3:202-205.

Furniss, M. J., T. D. Roelofs and C. S. Yee. 1991. Road Construction and Maintenance. In: Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats. American Fisheries Society.

Garvey, T. 1995. Preliminary Information from Large-Scale Disturbance Characterization Based on the Northeast Chichagof Island Blowdown Polygon Map. USDA Forest Service, Alaska Region, Tongass National Forest, Chatham Area, Sitka, AK.

Gende, S. M, M.F. Willson, B.H. Marston, M. Jacobson, and W.P. Smith. 1996. Bald Eagle Nesting in Relation to Clearcut Logging in Southeast Alaska. In review, Biological Conservation.

Harris, A. S. 1967. Natural Reforestation on a Mile-Square Clearcut in Southeast Alaska. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. Research Paper PNW-52.

Harris, A. S. 1989. Wind in the Forests of Southeast Alaska and Guides for Reducing Damage. USDA Forest Service, Pacific Northwest Research Station. Gen. Tech. Rep. PNW-GTR-244.

Harris, A. S. and W. A. Farr. 1974. The Forest Ecosystem of Southeast Alaska: 7. Forest Ecology and Timber Management. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. General Technical Report PNW-25.

Hawksworth, F. G. 1978. Bases for Control. In: Scharpf, R. F. And J. R. Parmeter, Jr. Proceedings of the Symposium on Dwarf Mistletoe Control Through Forest Management April 11-13, 1978,
p. 5-15. Berkeley, CA.

Haynes, R. and D. Brooks. 1994. Timber Products Output and Timber Harvests in Alaska: Projections for 1992-2010. PNW-GTR-334.

Hayward, G., C. Iverson, C. Crocker-Bedford, G. Degayner, K. Titus, J. Lindell, P. Schempf. 1995. Conservation Assessment for Northern Goshawk in Southeast Alaska. Tongass Land Management Planning Team. Juneau, Alaska.

Henderson, J. A. 1993. The Ecological Consequences of Long-rotation Forestry. In: J. F. Weigand, R. W. Haynes, and J. L. Mikowski, eds. High Quality Forestry Workshop: The Idea of Long Rotations. College of Forest Resources, Univ. of Washington. Seattle, WA. AR-10.

Hennon, P. E. and D. DeMars. 1995. Development of Wood Decay in Wounded Western Hemlock and Sitka Spruce in Southeast Alaska. USDA Forest Service, Pacific Northwest Forest Research Station.

Hennon, P. E. 1990. Wounding on Residual Sitka Spruce and Western Hemlock Remaining after Thinning on Prince of Wales Island, Alaska. USDA Forest Service, Alaska Region, Juneau, AK. Biological Evaluation R10-90-2.

Hennon, P. E. 1995. Literature on the Biology of Hemlock Dwarf Mistletoe: Emphasis on Management Opportunities with alternative Harvesting in Southeast Alaska. USDA Forest Service, Alaska Region, Juneau, AK

Hodges, J. I. 1982. Evaluation of the 100-meter Protective Zone for Bald Eagle Nests in Southeast Alaska. Raptor Management. Studies Rep. USDI, Fish and Wildlife Service, Juneau, AK.

Hunter, M. L., Jr. 1991. Coping with Ignorance: The Course-filter Strategy for Maintaining Biodiversity. In: K. A. Kohm, ed. Balancing on the Brink of Extinction. Island Press. Washington, D.C. pp. 266-281.

6 References

Irwin, L. R. and T.B. Wigley. 1992. Toward an Experimental Basis for Protecting Forest Wildlife. Ecological Applications. 3:213-217.

Iverson, C. 1996b. Large, Medium, and Small Old-growth Habitat Reserve Analysis. USDA Forest Service, Tongass Land Management Plan files.

Juday, G. P. 1984. Temperature Trends in the Alaska Climate Record: Problems, Update, Prospects. In: MacBeth, J. H, G. P. Juday, G. Weller, M. Murray, eds. The Potential Effects of Carbon Dioxide-induced Climate Changes in Alaska. Conference Proceedings. April 7-8, 1982. Misc. Publ. 83-1, UAF School of Agriculture and Land Resource Management.

Julin, K. R., and C. Meade. 1995 Forested Wetlands. Tongass Land Management Planning Team. Juneau, Alaska.

Kessler, S., F. Everest and C. Casipit. 1995. A Conceptual Fish/Watershed Reserve Proposal. Tongass Land Management Planning Team Juneau, Alaska.

Ketchikan Gateway Borough. 1994. Overall Economic Development Plan. Ketchikan, Alaska.

Keystone Center. 1991. Final Cncensus Report of the Keystone Policy Dialogue on Biological Diversity on Federal Lands. Keystone, CO.

Kiester, A. R. and C. Eckhardt. 1994. Review of Wildlife Management and Conservation Biology on the Tongass National Forest: A Synthesis with Recommendations. USDA Forest Service, PNW Research Station. Corvallis, OR.

Kirchoff, M., D. Person, V. Van Ballenberghe, C. Iverson, and E. Grossman. 1995. The Alexander Archipelago Wolf (*Canis lupus ligoni*), A Conservation Assessment. Tongass Land Managment Planning Team. Juneau, Alaska.

Knapp, G. 1992. Native Timber Harvests in Southeast Alaska. USDA Forest Service. PNW-GTR-284.

Kruse, J. and R. Frazier. 1988. Reports to the Communities of Southeast Alaska [one per community]. Tongass Resource Use Cooperative Survey. Institute of Social and Economic Research, University of Alaska Anchorage.

Lande, R. 1994. Tongass National Forest Land Management Plan Scientific Review. In: Kiester, A.R. and C. Eckhardt, eds. Review of Wildlife Management and Conservation Biology on the Tongass National Forest: A Synthesis With Recommendations, pp 109-122. UDSA Forest Service, Pacific Northwest Research Station, Corvallis OR.

Lande, R. and G. F. Barrowclough. 1987. Effective Population Size, Genetic Variation and their use in Population Management. In: Soulé, M.E., ed. Viable Populations for Conservation, pp. 109-122. Cambridge Univ. Press. Cambridge., MA

MacArthur, R. H. and E. O. Wilson. 1967. The Theory of Island Biogeography. Princeton University Press. Princeton, NJ.

MacDonald, S. O. and J. A. Cook. 1994. The Mammals of Southeast Alaska: A Distribution and Taxonomic Update. Univ. of Alaska Museum. Fairbanks.

Marcot, B. G., M. J. Widsom, H. W. Li and G. C. Castillo. 1994. Managing for Featured Threatened, Endangered, and Sensitive Species and Unique Habitats for Ecosystem

Sustainability. USDA Forest Service, PNW-GTR-329.

McCullough, D.R. 1994. Tongass National Forest Land Management Plan Scientific Review In: Kiester, A.R. and C. Eckhardt, eds. Review of Wildlife Management and Conservation Biology on the Tongass National Forest: A Synthesis With Recommendations, p. 109-122. UDSA Forest Service, Pacific Northwest Research Station, Corvallis OR..

McDowell Group. 1989. Alaska Seafood Industry Study - A Technical Report: An Economic Profile of the Seafood Industry in Alaska.

McDowell Group. 1995. Sitka Economic Base Study.

Noss, R.F. 1991. From Endangered Species to Biodiversity. In: K.A. Kohn, ed. Balancing on the Brink of Extinction. The Endangered Species Act and Lessons for the Future, p. 227-246. Island Press. Washington, D.C.

Nowacki, G. 1995. Natural Disturbance Regime Module for the Tongass Land Management Plan Revision. Tongass Land Managment Planning Team. Juneau, Alaska.

Oliver, C. D. and B. C. Larson. 1990. Forest Stand Dynamics. McGraw-Hill, New York.

Person, D., M. Kirchhoff, V. Van Ballenberghe, C. Iverson, and E. Grossman. 1996. The Alexander Archipelago Wolf (Canis lupus ligoni): A Conservation Assessment.

Person, D. K. and M. A. Ingle. 1995. Ecology of the Alexander Archipelago Wolf and Responses to Habitat Change. Progress Report No. 3. January 30, 1995.

Pletscher, D.H. 1994. Tongass National Forest Land Management Plan Scientific Review. In: Kiester, A. R. and C. Eckhardt, eds. Review of Wildlife Management and Conservation Biology on the Tongass National Forest: A Synthesis With Recommendations, p. 145-150. UDSA Forest Service, Pacific Northwest Research Station, Corvallis OR.

Ralph, C. J., G. L. Hunt Jr., M. G. Raphael, and J. F. Piatt. 1995. Ecology and Conservation of the Marbled Murrelet. U.S. Forest Service, Pacific Southwest Research Station, Gen. Tech. Rept. PSW-GTR-152.

Reynolds, R. T., R .T. Graham, M. H. Reiser, R. L. Bassett, P. L. Kennedy, D. A. Boyce Jr., G. Goodwin, R. Smith, and E. L. Fisher. 1991. Management Recommendations for Northern Goshawk in the Southwestern United States. USDA Forest Service. Southwestern Region.

Rogers, J. G. and N. Foster. 1996. Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the Endangered Species Act. Federal Register 61(26): 4721-4725.

Schoen, J. W., R. W. Flynn, L. H. Suring, K. Titus, and L. R. Beier. 1992. Habitat Capability Model for Brown Bear in Southeast Alaska. in L.H. Suring (ed) Habitat Capability Models for Wildlife in Southeast Alaska, p I2-I37. 1993. USDA Forest Service, Juneau.

Scott, J. M., B. Csuti, K. Smith, J. E. Estes, S. Caisso. 1991. Gap Analysis of Species Richness and Vegetation Cover; an Integrated Biodiversity Conservation Strategy. In: K. A. Kohm, ed. Balancing on the Brink of Extinction: The Endangered Species Act and Lessons for the Future, p. 282-297. Island Press. Washington D.C.

6 References

Shaffer, M. L. 1981. Minimum Population Sizes for Species Conservation. Bioscience 31:131-134.

Shaffer, M. L. 1987. Minimum Vable Populations; Coping with Uncertainty, p. 69-86.

Shea, K. R. and J. L. Stewart. 1972. Hemlock Dwarf Mistletoe. USDA Forest Service. U.S. Government Printing Office, Washington, DC. Forest Pest Leaflet 135.

Shields, G. F. 1995. Genetic Variation Among the Wolves of the Alexander Archipelago. Detailed final report submitted to Alaska Department of Fish and Game. Inst. Arctic Biol., Univ. Of Alaska, Fairbanks.

Smith, R. B. 1969. Assessing Dwarf Mistletoe on Western Hemlock. Forest Science 15:277-285.

Soulé, M. E. and B. A. Wilcox, eds. 1980. Conservation Biology; and Evolutionary-ecological Perspective. Sinauer Associates. Sunderland, MA.

Southeast Alaska Sportfishing Economic Study. 1991. Jones and Stokes Association, Inc., for Alaska Department of Fish and Game.

Stephens, F. R., C. R. Gass and R. F. Billings, 1969. Seedbed History Affects Tree Growth in Southeast Alaska. Forest Science 15:296-298.

Suring, L. H., editor. 1993. Habitat Capability Models for Wildlife in Southeast Alaska. USDA Forest Service, Alaska Region. Juneau, AK.

Suring, L. H., D. C. Crocker-Bedord, R. W. Flynn, C. S. Hale, G. C. Iverson, M. D. Kirchhoff, T. E. Schenck II, L. C. Shea, and K. Titus. 1993. A Proposed Strategy for Maintaining Well-distributed, Viable Populations of Wildlife Associated with Old-growth Forests in Southeast Alaska. Report of an Interagency Committee. unpubl. review draft report. Juneau, AK.

Suring, L. H., D. C. Crocker-Bedord, R. W. Flynn, C. S. Hale, G. C. Iverson, M. D. Kirchhoff, T. E. Schenck II, L. C. Shea, and K. Titus. 1994. Response to the Peer Review of: a Proposed Strategy for Maintaining Well-distributed, Viable Populations of Wildlife Associated with Old-growth Forests in Southeast Alaska. Report of an Interagency Committee. unpubl. report. Juneau, AK.

Swanston, D. N. 1995 Overview of Controlling Stability Characteristics of Steep Terrain in Southeast Alaska; with recommendations for revising and standardizing mass movement hazard indexing on the Tongass National Forest. USDA Forest Service, Tongass Land Management Planning Team. Juneau, Alaska.

Talbot, S. L. and G. F. Shields 1996. Phylogeography of Brown Bear (Ursus arctos) of Alaska and Paraphyly Within the Ursidae. Molecular Phylogenetic Evolution. (In Press).

Taylor, R. F. 1933. Site Prediction in Virgin Forests of Southeastern Alaska. Journal of Forestry 31:14-18.

Taylor, R. F. 1934. Yield of Second-Growth Western Hemlock-Sitka Spruce Stands in Southeastern Alaska. U.S. Department of Agriculture, Washington, DC. Technical Bulletin 412.

Thomas, J. W., E. D. Forsman, J. B. Lint, E. C. Meslow, B. R. Noon, and J. Verner. 1990. A Conservation Srategy for the Northern Spotted Owl. Interagency Committee to Address the Conservation of the Northern Spotted Owl. USDA Forest Service, USDI Bureau of Land

Management, Fish and Wildlife Service, and National Park Service. 1990-791-171-20026. U.S. Government Printing Office. Washington D.C.

Titus, K. and J. W. Schoen. 1993. A plan for Maintaining Viable and Well-distributed Brown Bear Populations in Southeast Alaska. In: L. S. Suring, ed. A proposed Strategy for Maintaining Well-distributed, Viable Populations Wildlife Associated with Old-growth Forests in Southeast Alaska: Report of an Interagency Committee, p 171-205, unpublished report.

U.S. Fish and Wildlife Service. 1995. A Conservation Assessment for the Marbled Murrelet in Southeast Alaska (Draft). Juneau, Alaska.

USDA Forest Service. 1983. Alaska Regional Guide. USDA Forest Service, Alaska Region, Juneau, AK. Alaska Region Report 126a.

USDA Forest Service. 1990. Silvics of North America, Volume 1. Conifers. USDA Forest Service, Washington, DC. Agriculture Handbook 654.

USDA Forest Service. 1994. Contracting Officer's Decision CDA 10-93-01.

USDA Forest Service. 1995 (also Julin 1995) Other Terrestrial Mammals Assessment Panel Summary. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1995 (also Rene' 1995) TLMP Revision Viability Synthesis Workshop, meeting notes. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1995. Marbled Murrelet Assessment Panel Summary. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1995. Overview of Goals for Management of Caves and Karst Topography on the Tongass National Forest. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1995. Productive Old Growth Forest Block Inventory. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1995. Stumpage Price Projections and Timber Demand Assumptions for TLMP Revision, meeting notes. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1995. Tongass Plan Revision Growth and Yield Estimates. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1995. Anadromous Fish Habitat Assessment Report to Congress. Pacific Northwest Research Station and Region 10. R10-MB-279.

USDA Forest Service. 1995. Geology, Minerals, and Karst Resources. In: Lab Bay Project Area Draft Environmental Impact Statement, p. 3-8 to 3-30. R10MB-296a.

USDA Forest Service. 1995. Tentatively Suitable Process for the TLMP Revision. Tongass Land Managment Planning Team. Juneau, Alaska.

USDA Forest Service. 1995. Assessment of Method to Estimate Site Quality for the TLMP Revision. Tongass Land Management Planning Team. Juneau, Alaska.

6 References

USDA Forest Service. 1995 Falldown during Implementation. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1996 (also Degayner 1996). Old growth Assessment Panel Summary. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1996 (also Degayner 1996). Sitka Black-tailed Deer Assessment Panel Summary. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1996 (also Iverson 1996) Alexander Archipelago Wolf Assessment Panel Summary. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1996 (also Iverson 1996). American Marten Assessment Panel Summary. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1996 (also Iverson 1996). Brown Bear Assessment Panel Summary. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1996 (also Iverson 1996). Northern Goshawk Assessment Panel Summary. Tongass Land Management Planning Team. Juneau, Alaska.

USDA Forest Service. 1996. Fish/Riparian Assessment Panel Summary. Tongass Land Management Planning Team. Juneau, Alaska.

Verner, J., K. S., McKelvey, B. R. Noon, R. J. Gutierrez, G. I Gould, Jr. and T. W. Beck., technical coordinators. 1992. The California Spotted Owl: A Technical Assessment of its Current Status.. Pacific Research Station, Albany CA. PSW-GTR-133U.

Wilcove, D. 1993. Getting Ahead of the Extinction Curve. Ecological Applications 3:218-??0

Wilcove, D. S., C. H. McLelloan and A. P. Dobson. 1986. Habitat Fragmentation in the Temperate Zone. In: Soulé, ed. Conservation Biology. The Science of Scarcity and Diversity, p. 237-256. Sinauer Associates, Inc. Sunderland MA.

Wright, E. and L. A. Issac. 1956. Decay Following Logging Injury to Western Hemlock, Sitka Spruce, and True Firs. U.S. Department of Agriculture, Washington, DC. Technical Bulletin 1148.

Chapter 7
Glossary

Chapter 7

Glossary

These definitions apply to Forest Service land management and planning. Meanings may differ when used in another context. Glossary definitions are not legal unless otherwise noted. Definitions were shortened, paraphrased or adapted to fit local conditions and for ease of understanding.

A

Access — The opportunity to approach, enter, and make use of public lands.

Access management — Acquiring rights and developing and maintaining facilities needed by people to get to and move through public lands (physical attributes).

Acquired Land — Lands in Federal ownership which were obtained by the Government through purchase, condemnation, gift, or by exchange.

Active channel — Unstable portion of a stream where stream channels are frequently changing course.

Activity fuel loading — The amount of burnable debris left after logging.

Adfluvial fish — Species or populations of fish that do not go to sea, but live in lakes, and enter streams to spawn.

Adjudicate — To settle in the exercise of judicial authority. To determine finally (Black. 1979, Black's Law Dictionary).

Administrative site — Lands used as headquarters or administrative facility by a Federal agency.

AFHA — See Anadromous Fisheries Habitat Assessment

Aggradation — The process of building up a land surface by deposition.

AHMU — Aquatic Habitat Management Unit.

AHRS — See Alaska Heritage Resource Survey.

Airshed — Geographical areas which, because of topography, meteorology, and climatic conditions, share the same air mass. Air is managed by airshed.

Alaska Heritage Resource Survey (AHRS) — The official list of cultural resources in the State of Alaska, maintained by the Office of History and Archaeology, Alaska Division of Parks and Outdoor Recreation.

Allowable Sale Quantity (ASQ) — The maximum quantity of timber that may be sold in each decade from suitable scheduled lands covered by the Forest Plan.

7 Glossary

Alluvial fan A cone-shaped deposit of organic and mineral material made by a stream where it runs out onto a level plain or meets a slower stream.

Alluvium Recent soil deposits resulting from modern rivers, including the sediment laid down in river beds, flood plains, lakes, and at the foot of mountain slopes and estuaries.

Alpine Parts of mountains above tree growth and/or the organisms living there.

Alternative One of several options proposed for decision making.

Ambient air That air, external to buildings, encompassing or surrounding a specific region.

Ambient Air Quality Standard The prescribed level of pollutants in the outside air that cannot be exceeded legally during a specified time in a specified geographical area.

Amenity Resource use, object, feature, quality, or experience that gives pleasure or is pleasing to the mind or senses. Amenity value typically describes those resource properties for which monetary values (or market values) are not or cannot be established.

Anadromous fish Fish which mature and spend much of their adult life in the ocean, returning to inland waters to spawn. Salmon and steelhead are examples.

Anadromous Fisheries Habitat Assessment An assessment conducted within the Tongass National Forest (1994) to study the effectiveness of current procedures for protecting anadromous fish habitat and determine the need for any additional protection.

Analysis area An area of land which has the same timber management costs and responses to timber management activities.

ANCSA The Alaska Native Claims Settlement Act of December 18, 1971. Public Law 92-203, 92nd Congress, 85 Stat. 688-716, which provides for the settlement of aboriginal land claims of the natives and native groups in Alaska.

ANILCA The Alaska National Interest Lands Conservation Act of December 2, 1980. Public Law 96-487, 96th Congress, 94 Stat. 2371-2551.

Appropriate suppression action The planned strategy for suppression action (in terms of kind, amount, and timing) on a wildfire which most efficiently meets fire management direction under current and expected burning conditions.

Critical protection Areas where human life or habitation are present have priority over all others. Immediate and continuous efforts are made to minimize loss of life and damage to property.
Full protection Valuable resources, such as commercial timber stands and historic structures exist; however, no human life or habitation exist in these areas. Immediate and aggressive action is taken to limit the number of acres burned.
Modified action Uninhabited; with resources of lesser value. Land managers consider tradeoff of acres burned versus suppression expenses. Fires during critical burning months are attacked, but a lower level of protection is provided when the risks of large, damaging fires is less.
Limited action Areas where the cost of fighting the fire is greater than the fire damage. Suppression efforts are limited to keeping a fire within a designated area or protecting critical sites within the areas.

Appropriation of land	The act of selecting, devoting, or setting apart land for a particular use or purpose, such as appropriating land for public buildings and military reservations or other public uses (Black, 1979).
Aquaculture	Maintaining, enhancing, and rehabilitating fish stocks through improvements and facilities, including the rearing of anadromous juvenile fish, generally in fresh water, for release into salt water for maturing, to become available as a common property resource.
Aquatic ecosystem	A stream channel, lake or estuary bed, the water itself, and the biotic communities that occur therein.
Aquatic farm (or Aquafarming)	Growing, farming, or cultivating aquatic products in captivity or under positive control. Current State of Alaska law (AS 16.40.100 - 16.40.199, July 1, 1990), does not allow the aquatic farming of finfish, but does allow the farming of shellfish.
ARC/INFO	ARC/INFO is the name of the Geographic Information System (GIS) software used for the Revision database.
Area of potential effects	The geographic area or areas within which an undertaking may cause changes in the character or use of historic properties, if any such properties exist.
Arterial road	Roads usually developed and operated for long-term land and resource management purposes and constant service.
Associated grave goods	The items placed with human remains at the time of interment.
ASQ	See Allowable Sale Quantity.
Atmospheric dispersion	The lofting and distribution of particulate matter from wood smoke into the atmosphere over time.
Augmentation funds	The funds used to finance timber purchaser constructed or reconstructed road without regard to whether the funds are contributed or supplemental.
Available timberlands	Timberland not withdrawn from use in production of timber products as a result of administrative statue or reguulation.

B

Background	The distant part of a landscape. The seen, or viewed, area located from three or five miles to infinity from the viewer. (See "Foreground" and "Middleground".)
Bank	The continuous margin along a river or stream where all upland vegetation ceases.
Beachlog salvage	The salvage of logs that have been washed-up on beaches. Special provisions in ANILCA allow beachlog salvage in Wilderness and National Monuments if it can be conducted without roads or use of vehicles on uplands.

7 Glossary

Bedload	Sand, silt, and gravel, or soil and rock debris rolled along the bottom of a stream by the moving water. The particles of this material have a density or grain size which prevents movement far above or for a long distance out of contact with the streambed under natural flow conditions.
Benchmark	An analysis of the supply potential of a particular resource, or set of resources, subject to specific management objectives or constraints. Benchmarks define the limits within which alternatives can be formulated.
Benthic	Pertaining to the sea bottom or to organisms that live on the sea bottom.
Best Management Practices (BMP's)	Land management methods, measures or practices selected by an agency meet its non-point source control needs. BMP's include, but are not limited to structural and nonstructural controls and operation and maintenance procedures. BMP's can be applied before, during and after pollution-producing activities to recude or eliminate the introduction of pollutants into receiving waters. BMP's are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.
Biological diversity	The distribution and abundance of different plant and animal communities and species within the area covered by a land management plan.
Biological potential	The maximum possible output of a given resource limited only by its inherent physical and biological characteristics.
Biomass	The total quantity, at a given time, of living organisms of one or more species per unit area or all of the species in a community.
Biome	The variety of life in an area, including the variety of genetic stocks, species, plant and animal communities, ecosystems, and processes through which individual organisms interact with one another and their environments.
Blowdown	See windthrow.
BMP's	See Best Management Practices.
Board foot	A unit of timber measurement equaling the amount of wood contained in an unfinished board 1 inch thick, 12 inches long and 12 inches wide.
Bole	Trunk of the tree. A tree stem once it has grown to substantial thickness—roughly to that capable of yielding poles, sawlogs, or veneer logs.
Boulders	Rounded or angular rocks greater than 12 inches in size.
Braided streams or channels	A stream flowing in several dividing and reuniting channels resembling the strands of a braid, the cause of division being the obstruction by sediment deposited by the stream.
BTU	British thermal unit. The quantity of heat required to raise the temperature of one pound of water by one degree Fahrenheit.

C

Canopy gap Openings created in second growth conifer stands by cutting all of the trees in a small area to maintain or increase the number of understory plant species.

Catastrophic event Events resulting from a great and sudden calamity or disaster. In the case of forest stands such events may include windstorms, wildfire, floods, snowslides, and insect outbreaks. Whether a disturbance event is called catastrophic is dependent on the contest within which the event occurs, the scale of the event, and the effects of the event.

Capability The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity.

Capital investment cost Costs generally associated with construction such as trails, roads, and physical structures.

Cave Cave is legally defined under federal law as "any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter, whether or not the entrance is naturally formed or human-made. Such term shall include any natural pit, sinkhole or other feature which is an extension of the surface," (Federal Cave Resource Protection Act of 1988). Speleologists use "cave" to refer to all parts, regardless of size, of an underground system that links openings and chambers and that may connect the system to the surface. Included in the term caves are tree molds and lava tubes associated with lava flows, erosional caves, and those formed by dissolution of bedrock.

CFL See Commercial forest land.

CFR Code of Federal Regulations.

Channel A passage, either naturally or artificially created, which periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. River, creek, run, branch, and tributary are some of the terms used to describe natural channels. Natural channels may be single or braided. Canal and floodway are some of the terms used to describe artificial channels.

Channel migration Movement of a stream or river channel within a floodplain area usually over an extended period of time.

Channel type A means of distinguishing parts of a stream system into segments which have fairly consistent physical and biological characteristics. For descriptions, see "Channel Type Field Guide," Publication R10-MB-6.

Claim To demand as one's own or as one's right; to assert; to urge; to insist (Black 1979).

Class (streams) See Stream class.

7 Glossary

Class II area (Air)	Geographic area having air quality exceeding the National Ambient Air Quality Standards, which is designated for a moderate degree of protection from future air quality degradation. Moderate increases in new pollution may be permitted.
Clearance	Cultural resources: Certification by the Forest Supervisor documenting that the requirements of 36 CFR 800 have been fully met for each undertaking.
Clearcut	Harvesting method in which all trees are cleared in one cut. It prepares the area for a new, even-aged stand. The area harvested may be a patch, stand, or strip large enough to be mapped or recorded as a separate age class in planning.
CMAI	See Culmination Mean Annual Increment.
Coarse filter	An approach used for wildlife conservation management and analysis which focuses on the characteristics of entire ecosystems and landscapes. (See also "fine filter.")
Coarse gravel	Rounded rocks generally 3/4 of an inch to 3 inches in size.
Cobbles	Rounded rocks between 3 and 12 inches in size.
Colluvial	Soil and material produced by the disintegration and weathering of rocks, including cliff debris, material of avalanches, and alluvium. This material accumulates at the foot of a slope.
Commercial forest land (CFL)	Forest land that is producing or is capable of producing crops of industrial wood and (a) has not been withdrawn by Congress, the Secretary, or the Chief; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity, or watershed conditions; and (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that adequate restocking can be attained within 5 years after final harvesting.
Commodities	Resources with monetary (market) or commercial value; all resource products which are articles of commerce, such as timber and minerals.
Common variety	Deposits of sand, stone, gravel, and others of widespread occurrence not having distinct special value. These deposits are used generally for construction and decorative purposes and are disposed of under the Materials Act of 1947.
Composition	A term in ecology referring to the numbers and types of species, plant communities, and smaller ecosystems within an area.
Condemnation	In real property law, the process by which property of a private owner is taken for public use, without his/her consent, but upon the award of payment for just compensation.
Confined streams	Streams that are confined within their channel banks; controlled by stream incision, geomorphic landform characteristics, and local geological conditions.
Confluence	The point where two streams meet.
Contributed funds	Funds used to pay for a portion of the work or materials needed to construct a road only to the standard needed for a timber sale, which could have properly been paid for by purchaser credits, if available.

Control (Nick) points Points in streams which are not easily erodible.

Convey To pass or transmit the title to property from one to another (Black 1979).

Conveyance An instrument by which some estate or interest in lands is transferred from one person to another (Black 1979); a transfer of legal title to land.

Corridor A linear strip of land defined for the present or future location of transportation or utility rights-of-way within its boundaries. Also, connective links of certain types of vegetation between patches of suitable habitat which are necessary for certain species to facilitate movement of individuals between patches of suitable habitat.

Cost Efficiency The usefulness of specified inputs (costs) to produce specified outputs (benefits). In measuring cost efficiency, some outputs, including environmental, economic, or social impacts, are not assigned monetary values, but are achieved at specified levels in the least cost manner. Cost efficiency is usually measured using present net value, although use of benefit-cost ratios and rates-of-return may be appropriate.

Created opening Openings in the Forest canopy created by silvicultural practices including shelterwood regeneration cutting, clearcutting, seed tree cutting, or group selection cutting.

Critical habitat Specific terrain within the geographical area occupied by threatened or endangered species, on which are found those physical and biological features that are essential to conservation of the species and which may require special management considerations or protection.

Crown The tree canopy. The upper part of a tree or woody plant that carries the main branch system and foliage.

Cubic foot Equivalent to a cube of wood with 1-foot sides. The cubic foot volume is a measure of the total sound wood in a tree and is a more accurate depiction of wood volume than the board foot measure. Forest Service policy is that cubic foot measure will be the basis for timber sales by Fiscal Year 1995 (WO Amendment 2400-92-4, 9/30/92).

Cull logs Trees that do not meet certain quality specifications.

Culmination Mean Annual Increment (CMAI) The point at which at tree (or stand) achieves its highest average growth, based on expected growth according to the management intensities and utilization standards assumed in the Forest Plan.

Cultural descendant A person who, although not necessarily a direct descendant of a particular deceased person, is associated with a cultural religious tradition to which the human remains of the deceased person has significance.

Cultural resources See Heritage Resources

Cumulative effects See Effects.

Cumulative watershed effects (CWE) The effects on a watershed's streams and lakes which result from the incremental impact of individual actions within a watershed when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative watershed effects can result from individually minor but collectively significant actions taking place over a period of time.

7 Glossary

D

DBH	See Diameter at Breast Height.
Dead	A standing tree that is completely dead. May be in various stages of decay.
Debris flows	The movement of material resulting from the decay and disintegration of rocks, earth, and other materials.
Debris slides	The rapid downslope movement of a mixture of soil, rock, and forest litter with or without a relatively high water content. Also known as debris avalanches.
Debris torrents	Landslides that occur as a result of debris; avalanche materials which either dam a channel temporarily or accumulate behind temporary obstructions such as logs and forest debris. Debris torrents are usually confined within the stream channel until they reach the valley floor where the debris spreads out, inundating vegetation and forming a broad surface deposit.
Decision criteria	The rules or standards used to evaluate alternatives. They are measurements or indicators that are designed to assist a decision maker in identifying a preferred choice from an array of possible alternatives.
Decks	Cut timber, sawlogs, or cull logs that have been removed from logging units and stacked.
Degradation	The general lowering of the surface of the land by erosive processes, especially by the removal of material through erosion and transportation by flowing water.
Demand	The amount of goods or services that will be consumed if offered over a given range of prices at a particular point in time.
Demographic	Pertaining to the study of the characteristics of human populations, such as size, growth, density, distribution, and vital statistics.
Departure	A timber harvest level that cannot be continued at that level forever.
Detrimental soil disturbance	The condition where established threshold values of soil properties are exceeded and result in significant change or impairment to long-term soil productivity. (See also, Significant change and Significant impairment.)
Detritis	Material, produced by the disintegration and weathering of rocks, that has been moved from its site of origin.
Developed recreation	That type of recreation that occurs where modifications (improvements) enhance recreation opportunities and accommodate intensive recreation activities in a defined area.
Diameter at Breast Height (DBH)	The diameter of a standing tree at a point four feet, six inches from ground level.
Digitize	The act of placing spatial information into a computer.

Discharge velocity	The speed of water outflow from a stream or river over a given period of time.
Discount rate	The rate used to adjust future benefits or costs to their present value.
Dispersed recreation	That type of recreation use that requires few, if any, improvements and may occur over a wide area. This type of recreation involves activities related to roads, trails and undeveloped waterways and beaches. The activities do not necessarily take place on or adjacent to a road, trail, or waterway, only in conjunction with it. Activities are often day-use oriented and include hunting, fishing, boating, off-road vehicle use, hiking, and among others.
Dispersion	To disperse the effects of timber harvest by distributing harvest units more or less uniformly throughout a drainage so that increased runoff and sediment from disturbed sites will be buffered by lower levels of runoff and sediment production from surrounding undisturbed lands.
Dissected landforms	A physical, recognizable form or feature of the earth's surface such as a mountain, hill, or valley, having a characteristic shape, that in part is the result of several shallow or deeply incised drainage channels.
Dissolved oxygen	The amount of free (not chemically combined) oxygen in water.
Distance zone	Areas of landscapes denoted by specified distances from the observer (foreground, middleground, or background). Used as a frame of reference in which to discuss landscape characteristics of management activities.
Diversity	The distribution and abundance of different plant and animal communities and species within the area covered by a land and resources management plan.
Down	A tree or portion of a tree which is dead and laying on the ground.
Draft Environmental Impact Statement (DEIS)	The version of the statement of environmental effects required for major Federal actions under Section 102 of the National Environmental Policy Act (NEPA) and released to the public and other agencies for review and comment. It is a formal document which must follow the requirements of NEPA, the Council on Environmental Quality (CEQ) Guidelines, and directives of the agency responsible for the project proposal. (See also Environmental Impact Statement.)
Duff layer	The general term for vegetation material covering the mineral soils in forests including the fresh litter and well-decomposed organic material and humus.
Dust, fugitive or Fugitive dust	Particulate matter composed primarily of soil which is uncontaminated by industrial activities. Examples are emissions from haul roads and wind erosion.
Dying	A standing tree partially dead above ground and likely to die in the future.

E

Easement	An interest or right in land owned by another that entitles its holder to a specific limited use.

7 Glossary

Ecological provinces
Subdivisions of Southeast Alaska with the following traits: 1) species composition within each province is more similar than between adjacent provinces, 2) patterns in distribution are similar for many kinds of organisms, and 3) historical events (such as glaciers and uplifting) are important to the nature of the province and to the barriers that distinguish each province. 21 ecological provinces have been identified on the Tongass.

Ecosystem
A complete, interacting system of organisms considered together with their environment (for example; a marsh, a watershed, or a lake).

Ecotone
A transition or junction zone between two or more naturally occurring diverse plant communities (ecosystems).

Ecotype
A species of plant or animal that displays different genetic or physiological adaptations. For example, the brown bear in Southeast Alaska is the same species as the grizzly bear in interior Alaska, but the brown bear is smaller than the grizzly.

Effect
In Cultural Resources, the potential of an undertaking to alter the characteristics that may qualify a property for inclusion in the National Register of Historic Places.

Effects
Direct. Results of an action occurring when and where that action takes place.
Indirect. Results of an action occurring at a location other than where the action takes place and/or later in time, but in the reasonably foreseeable future.
Cumulative. Results of collective past, present, and reasonably foreseeable future actions.

EIS
See Environmental Impact Statement.

Emergent
A plant rooted in shallow water and having most of its vegetation above water (cattails).

Encumbrance
A claim, lien, charge, or liability attached to and binding real property (Black 1979).

Endangered species
Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1978 Endangered Species Act.

Endemic
Restricted to a particular locality.

Enhance
To improve, reinforce, enrich or strengthen the existing condition, value, or beauty of a resource.

Entitlement
Right to benefits, income or property which may not be abridged without due process (Black 1979).

Environmental analysis
An analysis of alternative actions and their predictable short- and long-term environmental effects, incorporating the physical, biological, economic, social and environmental design arts and their interactions.

Environmental Impact Statement (EIS)	A document prepared by a federal agency in which anticipated environmental effects of a planned course of action or development are evaluated. A federal statute (Section 102 of the National Environmental Policy Act of 1969) requires that such statements be prepared. It is prepared first in draft or review form, and then in a final form. An impact statement includes the following points: (1) the environmental impact of the proposed action, (2) any adverse impacts which cannot be avoided by the action, (3) the alternative courses of actions, (4) the relationships between local short-term use of the human environment and the maintenance and enhancement of long-term productivity, and (5) a description of the irreversible and irretrievable commitment of resources which would occur if the action were accomplished.
Ephemeral channels	A stream that flows in direct response to rainfall and snowmelt but not during dry seasons. Its channel is above the level of the water table.
Equipment fires	Those wildfires originating from the use of equipment in forest operations such as logging, yarding, chainsaws, land clearing, road building, etc.
Erosion	The wearing away of the land surface by running water, wind, ice, gravity or other geological activities.
Escapement	Adult anadromous fish that escape from all causes of mortality (natural or human-caused) to return to streams to spawn.
Estuary	An ecological system at the mouth of a stream where fresh water and salt water mix, and where salt marshes and intertidal mudflats are present. The landward extent of an estuary is the limit of salt-intolerant vegetation, and the seaward extent is a stream's delta at mean low water.
Evaluation	The analysis and interpretation of information collected through monitoring.
EVC	See Existing Visual Condition.
Evapotranspiration	The sum total of water lost from the land by evaporation and plant transpiration. Transpiration is loss of water in vapor form from a plant.
Even-aged management	The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. The difference in age between trees in forming the main canopy level of a stand usually does not exceed 20 percent of that age of the stand at harvest rotation age. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.
Exchange	A trading of public lands (surface or subsurface estates) that usually do not have high public value for lands in other ownerships which do have value for public use, management, and enjoyment.
Executive Order	An order or regulation issued by the President or some administrative authority under his direction.
Existing data search	A systematic check and evaluation of available records, documents, and informant sources to gather information pertinent to cultural resources within a given area.

Existing Visual Condition (EVC)

EVC ratings are established to give the land manager an indication of the current level of visual quality and visual evidence of management activities. EVC classes are as follows:
Type 1. Appears to be untouched by human activities, except for trails needed for access; only ecological changes have occurred.
Type 2. Changes in the landscape are not noticed unless pointed out.
Type 3. Changes in the landscape are noticed as minor disturbances, but the natural appearance of the landscape remains dominant.
Type 4. Changes in the landscape are easily noticed and perceived as disturbances, but resemble natural patterns.
Type 5. Changes stand out as a dominant impression on the landscape, yet are shaped to resemble natural patterns from 3-5 miles or more distant.
Type 6. Changes are in glaring contrast to the landscape's natural appearance; excessive visual alteration has occurred.

F

Facility

Structures needed to support the management, protection, and utilization of the National Forests, including buildings, utility systems, dams, and other construction features. There are three types of facilities: recreation, administrative, and permitted.

Falldown

The difference between the number of acres planned for timber harvest and those actually harvested, usually experienced as a reduction in acres. Falldown results from many factors, including unmapped unsuitable timber land, newly available information, and project-level consideration of site-specific issues and non-timber resource needs.

Feasible

Capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, technical, and safety factors. In evaluating feasibility, the following are considerations: 1) the effectiveness and practicality of the measures being considered; 2) the long- and short-term costs of the measures and the effect of those costs on long- and short-term economic viability of projects or programs.

FHAT

See Fish Habitat Assessment Team

FHIP

See Forest Habitat Integrity Program

Fine filter

An approach used for wildlife conservation management and analysis which focuses on individual species and their habitat needs. (See also "coarse filter.")

Fire Management Action Plan

A plan which provides detailed information for, and guides the implementation of, fire management activities for the approved alternative for the Forest Plan.

Fire severity

How hot a fire is for how long. The hotter a fire is and the longer it burns, the more severe it is.

Fire suppression

All the work of extinguishing or confining a fire, beginning with its discovery.

Fiscal Year (FY)

October 1 to September 30. The Fiscal Year is referred to by the calender year which begins on January 1. For example, October 1, 1991, to September 30, 1992, is referred to as Fiscal Year 1992.

Fish Habitat Assessment Team	The team that conducted the on-the-ground analysis for the Anadromous Fisheries Habitat Assessment
Fish Passage	The ability of both adult and juvenile fish to move both up and down stream.
Fish User Day (FUD)	A recreation visitor day spent fishing or viewing fish.
Flash flooding	A very rapid responding, relatively high streamflow overtopping the banks in any reach of a stream.
Floodplain	That portion of a river valley, adjacent to the river channel, which is covered with water when the river overflows its banks at flood stages.
Fluvial	Of, or pertaining to, streams and rivers.
Foodfish	Fish consumed by humans.
Footslope	The inner, gently inclined surface at the base of a hill or mountain slope. The surface profile is dominantly concave, and is the transition zone between upslope erosional sites and downslope depositional sites.
Forbs	A grouping/category of herbaceous plants which are not included in the grass, shrub or tree groupings/categories; generally smaller flowering plants.
Foreground	A term used in visual management to describe the stand of trees immediately adjacent to a scenic area, recreation facility or forest highway. The area is located less than 1/4 mile from the viewer. (See Background and Middleground.)
Forest Development Transportation Plan	The plan for the system of access roads, trails, and airfields needed for the protection, administration, and utilization of the National Forests and other lands administered by the Forest Service, or the development and use of resources upon which communities within or adjacent to the National Forests are dependent (36 CFR 212.1).
Forest Facility Master Plan	The plan which depicts the development and management of the Forest's facilities. This includes current volume of business and projections for the future, locations for needed skills to perform program work, existing administrative sites and proposed locations of new sites, and management strategies concerning consolidation or sharing services between units (FSM 7312.1).
Forest Habitat Integrity Program	A method of classifying watersheds based on specific resource attributes.
Forest health	A condition where biotic and abiotic influences on the forest (i.e., insects, diseases, atmospheric deposition, silvicultural treatments, harvesting practices) do not threaten management objectives for a given forest unit now or in the future.
Forest Plan	Source of management direction for an individual Forest specifying activity and output levels for a period of 10-15 years. Management direction in the plan is based on the issues identified at the time of the plan's development.
Forested land	Land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for non-forest use.

Forested wetland — A wetland whose vegetation is characterized by an overstory of trees that are 20 feet or taller.

Forest-wide Standards and Guidelines — Establish the environmental quality, natural renewable and depletable resource requirements, conservation potential, and mitigation measures that apply to several land use designations.

FORPLAN — The forest planning model. A linear programming software package used to analyze planning decisions regarding land use patterns, capital investment, and timber harvest scheduling.

Fragmentation — An element of biological diversity that describes the natural condition of habitats in terms of the size of discrete habitat blocks or patches, their distribution, the extent to which they are interconnected, and the effects of management on these natural conditions.

Free use permit — A permit that allows the removal of timber or other resources from public lands free of charge.

FSH — Forest Service Handbook.

FSM — Forest Service Manual.

FUD — See Fish User Day.

Fuel — The organic materials that will support the start and spread of a fire: duff, litter, grass, weeds, forbs, brush, trees, dead woody materials.

Fuel loading — The volume of the available or burnable fuels in a specified area.

Function — A term in ecology referring to the interreactions and influences between plant and animal species within an area (how each species uses its environment), and to natural processes of change or disturbance (such as wind or aging).

FY — See Fiscal Year.

G

Genetic descendant — A person known or reliably assumed to have a genetic relationship to a deceased person.

Geographic provinces — Subdivisions of Southeast Alaska used to define natural diversity, including areas with distinctive regional climate, physiography, and geology. Seven geological provinces have been identified on the Tongass.

Glacial refugia — The areas of Southeast Alaska that were not covered by glaciers during the last ice age.

Glacial rivers and streams — Rivers and streams that receive their main flow characteristics from the presence and activities of ice and glaciers and their meltwater.

Glide or placid streams Grouping of channel types (L1 and L2) that have fairly consistent physical characteristics occurring on lowland landforms and are mostly associated with bogs, marshes, or lakes.

Goal A concise statement that describes a desired future condition normally expressed in broad, general terms that are timeless, in that there is no specific date by which to goal is to be achieved.

Goods and services The various outputs and on-site uses produced from forest resources.

Groundwater Water within the earth that supplies wells and springs. Specifically, water in the zone of saturation where all openings in soils and rocks are filled; the upper surface level forms the water table.

Group Selection A harvesting method in which trees are removed in small groups at a time.

Guideline A preferred or advisable course of action or level of attainment designed to promote achievement of goals and objectives.

Guyline circle Guylines are cables to brace the tower (spar) used in cable logging systems. Using the tower as the center, the guyline circle is the area between the tower and where the guylines are anchored. For safety reasons, this area is usually cleared of all trees.

H

Habitat The sum total of environmental conditions of a specific place occupied by a wildlife or plant species or a population of each species.

Habitat capability The maximum number of fish or wildlife that a habitat can produce.

Habitat conservation area A contiguous unit of a particular habitat type to be maintained or managed to perpetuate that habitat. The most common form of "management" is to protect the area from future alterations, and rehabilitate existing altered habitats as needed. For the Tongass, these areas are essentially all blocks of old-growth forest.

Hard snags/soft snags Terminology used to described the state of the decay process in dead trees. Hard snags are dead trees which have little decay and are generally still hard wood. Soft snags are dead trees which have a considerable amount of decay and are generally soft, broken wood.

Haul out Areas of land used by marine mammals for resting and other social/biological activities which occur out of the water.

HCA See Habitat conservation area

Heritage Resources The physical remains of districts, sites, structures, buildings, networks, events, or objects used by humans in the past. They may be historic, prehistoric, architectural, or archival in nature. Heritage resources are non-renewable aspects of our national heritage.

7 Glossary

Historic property — Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places. The term includes artifacts, records, and remains that are related to and located within such properties.

Human remains — The physical remains of human bodies.

Hunter Day — One hunter day is equivalent to one person hunting for any length of time during a 24 hour period.

Humus — Substance of organic origin that is fairly but not entirely resistant to further bacterial decay.

Hydrologic cycle — The complete cycle through which water passes, commencing as atmospheric water vapor, passing into liquid and solid form as precipitation, thence along or into the ground surface, and finally again returning to the form of atmospheric water vapor by means of evaporation and transpiration. Also called Water Cycle.

Hydrophyte — Plants typically found in wet habitats.

I

IDT — See Interdisciplinary Team.

Ignition — The initiation of combustion.

Implementation — For cultural resources, that point in an undertaking when the proponent has full and complete authorization to proceed with the undertaking.

Improvements — Includes any structures of a permanent nature placed upon the land, which tend to increase its value.

Industrial Wood — All commercial roundwood products, except fuelwood.

Infrastructure — The facilities, utilities, and transportation systems needed to meet public and administrative needs.

Inherent capability — Recreation capability for the physical, social and managerial setting for recreation, based on remoteness from modern human development and activity, modification of the land, and social factors such as crowding.

Integrated Pest Management (IPM) — A process for selecting strategies to regulate forest pests in which all aspects of a pest-host system are studied and weighed. A basic principle in the choice of strategy is that it be ecologically compatible or acceptable.

Intensity — How hot a fire is. Specifically, a measure (in BTU's per foot per second) of the energy released per unit of time in an area of actively burning fire. The amount of heat released per foot of fire front per second.

Inter — To place in a grave or tomb.

Interceptions
The process by which precipitation is caught and held by foliage, twigs, and branches of trees, shrubs, and other vegetation, and lost by evaporation, never reaching the surface of the ground. Interception equals the precipitation on the vegetation minus stemflow and throughfall.

Interest
A general term to denote a right, claim, title, or legal share in real estate (Black 1979).

Interdisciplinary Team (IDT)
A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view and a broader range of expertise to bear on the problem.

Invertebrate population
That population of creatures without a backbone. Context would depict whether land invertebrates, shore invertebrates, or water invertebrates.

Invertebrates
Animals without a backbone.

IPM
See Integrated Pest Management.

Irretrievable commitments
Applies to losses of production or use of renewable natural resources for a period of time. For example, timber production from an area is irretrievably lost during the time an area is allocated to a no-harvest prescription. If the allocation is changed to allow timber harvest, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible commitments
Decisions causing changes which cannot be reversed. For example, if a roadless area is allocated to allow timber harvest and timber is actually harvested, that area cannot, at a later date, be allocated to Wilderness. Once harvested, the ability of that area to meet Wilderness criteria has been irreversibly lost. Often applies to nonrenewable resources such as minerals and cultural resources.

Issue
A point, matter, or section of public discussion or interest to be addressed or decided.

K

Karst
A type of topography that develops in areas underlain by soluble rocks, primarily limestone. Dissolution of the subsurface strata results in areas of well-developed, surface drainage that are sinkholes, collapsed channels, or caves.

L

Lacustrine wetland
Includes permanently flooded lakes and reservoirs, intermittent lakes, and tidal lakes with ocean-derived salinities of less than 0.5 percent. Typically, there are extensive areas of deep water and there is considerable wave action.

Land allocation
The decision to use land for various resource management objectives to best satisfy the issues, concerns and opportunities and meet assigned forest output targets.

Land exchange
The conveyance of non-Federal land or interests to the United States in exchange for National Forest System land or interests in land.

7 Glossary

Land Use Designation (LUD)
(As used in the 1979 Tongass Land Management Plan:) General management direction applied to a Value Comparison Unit or group of Value Comparison Units. These four land use designations are defined as follows.
LUD 1. Forest Service recommended Wilderness areas, most of which became Wilderness through the Alaska National Interest Lands Conservation Act. In general, these undeveloped areas are managed for solitude and primitive types of recreation, and contain unaltered habitats for plants and animal species. These areas are managed as directed in the 1964 Wilderness Act, as amended.
LUD 2. Lands under this designation are managed in a roadless state to retain their wildland character. Primitive recreational facilities can be built and habitat improvements for fish and wildlife are permitted. Timber harvest on these lands is limited to salvage operations to protect other resources.
LUD 3. These lands are managed for a variety of uses. The emphasis is on managing for both amenity and commodity oriented uses in a compatible manner to provide the greatest combination of benefits. These areas usually have high amenity values in conjunction with high commodity values. Allowances in calculated potential timber yield have been made to meet multiple-use coordination objectives.
LUD 4. These lands are managed to provide opportunities for intensive development of resources. Emphasis is primarily on commodity, or market resources and their use. Amenity values are also provided for. When conflicts over competing resource uses arise, conflicts would most often be resolved in favor of commodity values. Allowances in calculated potential timber yield have been made to provide for protection of physical and biological productivity.

Land Use Designation (LUD)
(As used in the Tongass Land Management Plan Revision:) A defined area of land specific to which management direction is applied. (See also Land Use Prescriptions.)

Land Use Prescriptions
Specific management direction applied to a defined area of land (land use designation as defined in the Revision) to attain multiple use and other goals and objectives.

Land Utilization Project (LUP)
A unit designated by the Secretary of Agriculture for conservation and utilization under Title III of the Bankhead-Jones Farm Tenant Act (USDA Forest Service, undated, Land Areas of the National Forest System).

Landform
Any physical, recognizable form or feature of the earth's surface, having a characteristic shape, and produced by natural causes. Major forms included are plains, plateaus, and mountains; minor forms are hills, valleys, slopes, eskers, and dunes.

Landslides
The moderately rapid to rapid downslope movement of soil and rock materials that may or may not be water-saturated.

Large Woody Debris (LWD)
Any piece of relatively stable woody material, having a diameter of four inches or greater and a length greater than three feet, that intrudes into a stream channel. Formerly called large organic debris.

Leasable minerals
Generally includes minerals such as coal, oil, gas, phosphate, sodium, potassium, oil shale, sulfur, and geothermal steam.

Lease
An authorization (usually long-term) to possess and use public lands for a fixed period of time.

Leave strips
The result of timber harvest activities where blocks of timber are left after harvest has occurred.

Lifeform	Any living entity, animal or plant.
Locatable minerals	Include gold, silver, lead, zinc, copper, and mercury.
Log Transfer Facilities (LTF)	Formerly referred to as Terminal Transfer Facilities, Log Transfer Facilities include the site and structures used for moving logs and timber products from land-based transportation forms to water-based transportation forms.
Logging slash	The wood residue left on the ground after harvesting. It includes unused logs, uprooted stumps, broken or uprooted stems, tops, branches, and leaves.
Logging systems	**Tractor.** A system of log transportation in which logs are pulled from the woods to a landing by means of a crawler tractor, skidder, or similar ground-based equipment. **High-lead.** A system of cable logging in which the working lines are elevated at the landing area by a rigged wooden tree or portable steel spar. **Skyline.** A system of cable logging in which all or part of the weight of the logs is supported during yarding by a suspended cable. **Balloon.** A system of cable logging in which the weight of the logs is counteracted by the lift provided by a lighter-than-air balloon. **Helicopter.** A system of transporting logs from the woods to a landing as an external load on a helicopter.
Long-term Sustained Yield Timber Capacity (LTSY)	The highest uniform wood yield from suitable-scheduled lands that may be sustained in perpetuity consistent with the Forest Plan.
Lows	Atmospheric disturbances that can properly be considered as storms, for they bring changeable, unsettled weather that normally includes widespread, abundant, and often, intensive precipitation.
LTSY	See Long-term Sustained Yield Timber Capacity.
LTF	See Log Transfer Facilities.
LUD	See Land Use Designation. (Note that there are two definitions for Land Use Designation: as used in the 1979 Tongass Land Management Plan and as used in the Tongass Land Management Plan Revision.)
LUP	See Land Utilization Project.
LWD	See Large woody debris.

M

Macrophytes	Any plant species that can be readily observed without the aid of optical magnification.
Managed stand	A stand of trees in which stocking level control is applied to achieve maximum growth.
MAI	See Mean Annual Increment.
Management Area	Combinations of Value Comparison Units having common management direction. As defined in the Tongass Plan Revision.

Management concern	An issue, problem or a condition which constrains the range of management practices identified by the Forest Service in the planning process.
Management direction	A statement of multiple-use and other goals and objectives, the associated land use prescriptions, and standards and guidelines for attaining them.
Management Indicator Species (MIS)	Species selected in a planning process that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.
Management practices	The activities applied to a defined area of land (land use designation as defined in the Revision) to attain multiple-use and other goals and objectives.
Management requirement	Standards for resource protection, vegetation manipulation, silvicultural practices, even-aged management, riparian areas, soil and water and diversity, to be met in accomplishing National Forest System goals and objectives. (See 36 CFR 219.17)
Mariculture	The cultivation of plants and animals in saltwater, with no freshwater component. Mariculture does not include anadromous fish farming.
Marine systems	Of, or belonging to, or caused by, the sea.
Maritime climate	Weather conditions controlled by an oceanic environment characterized by small annual temperature ranges and high precipitation..
Mass-wasting	A general term for a variety of processes by which large masses of earth material are moved by gravity either slowly or quickly from one place to another. Also, mass movement.
MBF	Thousand Board Feet.
Mean Annual Increment (MAI)	The total volume of a stand divided by its age.
Memorandum of Understanding (MOU)	A legal agreement between the Forest Service and others agencies resulting from consultation between agencies that states specific measures the agencies will follow to accomplish a large or complex project. A memorandum of understanding is not a fund obligating document.
Microclimate	The temperature, moisture, wind, pressure, and evaporation (climate) of a very small area that differs from the general climate of the larger surrounding area.
Middleground	The visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly from the landscape. The area is located from 1/4 to 3-5 miles from the viewer. (See Foreground and Background.)
Mineral development	The activities and facilities associated with extracting mineral deposits.
Mineral entry	Filing a mining claim on public land to obtain the right to mine any minerals it may contain. Also the filing for a mill site on Federal land for the purpose of processing off-site minerals.
Mineral exploration	The search for valuable minerals on lands open to mineral entry.

Mineral lease A lease which authorizes the development and production of leasible minerals from public lands.

Mineral production The extraction of mineral deposits.

Mineral rights The rights of one who owns the mineral estate (subsurface).

Mineral soils Soils consisting predominantly of, and having its properties determined by, mineral matter. These soils usually contain less than 20 percent organic matter, but can contain an organic surface layer up to within 20 inches of the surface.

Mineral withdrawal A formal designation by the Secretary of Interior which precludes entry or disposal of mineral commodities under the mining and/or mineral leasing laws.

Minimum viable population The low end of the number of individuals of a species needed to ensure the long-term existence of the species.

Mining claims A geographic area of the public lands held under the general mining laws in which the right of exclusive possession is vested in the locator of a valuable mineral deposit.

MIS See Management Indicator Species.

Mitigate To lessen or make minimal the severity. For cultural resources, to lessen or minimize an adverse effect upon a cultural resource listed on or eligible for the National Register of Historic Places. The two categories of mitigation most often used are project modification and data recovery.

Mixed conifer In Southeast Alaska, mixed conifer stands usually consist of the following species: western hemlock, mountain hemlock, Alaska yellow-cedar, redcedar, and Sitka spruce. Shorepine may occasionally be present depending on individual sites. Redcedar is not usually in mixed conifer stands on the Chatham or Stikine areas.

MMBF Million Board Feet.

Modal Relating to the statistical mode.

Moderately well-drained soil Water in these soils is removed from them somewhat slowly, so that the profile is wet for a small, but significant, part of the time.

Modification See Visual Quality Objectives.

Moisture regime The variation of moisture content in a specified portion of soil during the year.

Monitoring and Evaluation A process of collecting significant data from defined sources to identify departures or deviations from expected plan outputs.

Mop-up Following suppression activities to stop the spread of the fire, the business of extinguishing the fire is called mop-up.

MOU See Memorandum of Understanding.

Multiple-aged stands An intermediate form of stand structure between even- and uneven-aged stands. These stands generally have two or three distinct tree canopy levels occurring within a single stand.

Multiple use	The management of all the various renewable surface resources of the National Forest System so that they are used in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of the resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some lands will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.
Muskeg	A muskeg in Southeast Alaska is a type of bog that has developed over thousands of years in depressions, or flat areas on gentle to steep slopes. These bogs have poorly drained, acidic, organic soils materials that support vegetation that can be either sphagnum moss or herbaceous plants or sedges, rushes, and forbs or may be a combination of sphagnum moss and herbaceous plants. These vegetation types may have a lesser abundance of shrubs and stunted trees.

N

National Cooperative Soil Survey (NCSS)	A program consisting of a joint effort of cooperating Federal agencies, land-grant universities, and other state and local agencies to map soils, collect soil data, interpret the maps and data, and promote their use. Federal leadership is provided by the Soil Conservation Service (SCS).
National Environmental Policy Act of 1969 (NEPA)	An act declaring a National policy to encourage productive harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and the biosphere and simulate the health and welfare of man, to enrich the understanding of the ecological systems and natural resources important to the Nation and to establish a Council on Environmental Quality.
National Fire Management Analysis System (NFMAS)	A broad umbrella process to help fire managers identify the most efficient fire program meeting the direction in the Forest plan. This includes information for the planning record on program composition, annual programmed costs, emergency fire fighting costs, expected resource impacts, and net value change.
National Forest Management Act (NFMA)	A law passed in 1976 that amends the Forest and Rangeland Renewable Resources Planning Act and requires the preparation of Forest Plans.
National Forest System(NFS) Land	Federal lands that have been designated by Executive order or statute as National Forests, National Grasslands, or Purchase Units, or other lands under the administration of the Forest Service.
National Register of Historic Places	A register of cultural resources of national, state, or local significance, maintained by the Department of the Interior.
National Wild and Scenic River System	Rivers with outstanding scenic, recreational, geological, fish and wildlife, historic, cultural, or other similar values designated by Congress under the Wild and Scenic Rivers Act for preservation of their free-flowing condition.

Native selection

Application by Native corporations formed under authority of the Alaska Native Claims Settlement Act of 1971 (ANCSA - Public Law 92–203, 85 Stat. 688) and by Native individuals (under Section 14(h)(5), ANCSA) to the USDI Bureau of Land Management (BLM) for conveyance of a portion of lands withdrawn under ANCSA in fulfillment of Native entitlements established under ANCSA. Native village corporations had three years from the date of ANCSA (December 18, 1971) to make their selections and regional corporations had four years. Native individuals who met the criteria had two years from the date of ANCSA to make application under Section 14(h)(5). BLM regulations allowed Native corporations formed under ANCSA to select in excess of their entitlements to ensure sufficient land would be available to meet full entitlement. Remaining lands in excess of entitlement which have been selected but not conveyed will revert back to unencumbered National Forest System land status after full entitlement is reached.

Net public benefit

The overall long-term value to the Nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index.

Net sawlog volume

Trees suitable in size and quality for producing logs that can be processed into lumber. In Southeast Alaska, depending on the market, the volume may be processed as pulp or lumber.

Net willingness-to-pay

The amount that a person would have paid for an activity above and beyond what the person actually did pay for that activity.

NIC

See Non-interchangeable Components

No action alternative (Alternative C)

The most likely condition expected to exist in the future if current management direction were to continue unchanged.

No adverse effect

When the effect on a cultural resource would not be considered harmful to those characteristics that qualify the property for inclusion in the National Register.

Noncommercial species

Species that have no economic values at this time nor anticipated timber value within the near future.

Non-declining even flow

A policy governing the volume of timber removed from a National Forest, which states that the volume planned for removal in each succeeding decade will equal or exceed that volume planned for removal in the previous decade.

Nonforest land

Land that has never supported forests and lands formerly forested but now developed for such nonforest uses as crops, improved pasture, etc.

Non-interchangeable Components

Portions of the allowable sale quantity that are scheduled and tracked as individually accountable categories. Chargeable timber volume from one non-interchangeable component cannot be substituted for the achievement of the volume limit of another component, nor can the limits on timber volume associated with each non-interchangeable component be exceeded. For the Revised Supplement two non-interchangeable components, or NIC's, are used:

NIC I. Normal operable volume scheduled from suitable lands that are available for harvest using existing logging systems (e.g. high-lead, single-span skyline, and shovel). This is the best (most economic) operable ground and is typically where the Forest has been offering sales since 1980.

NIC II. Non-standard operable volume scheduled from suitable lands that are available for harvest using advanced logging systems not in common use (e.g. helicopter, balloon, and mulit-span skyline). These lands are presently considered economically and technologically marginal. This volume component has rarely been economic in the past, and usually only attained by additional investment (i.e., pre-roading and advanced logging technology).

Nonmarket — Products derived from National Forest resources that do not have a well-established monetary (market) value, for example, wilderness, wildlife. (Noncash economic benefits.)

Nunatak — An isolated hill or peak which projects through the surface of a glacier.

O

Objectives — The precise steps to be taken and the resources to be used in achieving goals.

Off-Highway Vehicle (OHV) — Any vehicle which is restricted by law from operating on public roads for general motor vehicle traffic. Includes motorbikes, minibikes, trailbikes, snowmobiles, dunebuggies, all-terrain vehicles, and four-wheel drive, high clearance vehicles (FSM 2355.01). Sometimes referred to as Off-Road Vehicle or "ORV".

OHV — See Off-Highway Vehicle.

Old growth — Ecosystems distinguished by old trees and related structural attributes. Old growth encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics which may include larger tree size, higher accumulations of large dead woody material, multiple canopy layers, different species composition, and different ecosystem function. The structure and function of an old-growth ecosystem will be influenced by its stand size and landscape position and context.

Open road density — The length of forest development roads open for public access and use per unit area of land; usually expressed as miles of open road per square mile of land.

Operability — Operability refers to timber harvest operability, defined as the method(s) of timber harvest necessary to get the trees from stump to landing. There are three different classes of operability: normal (tractor and highlead cable), difficult (long span skyline), and isolated (helicopter).

Operation and maintenance costs — Costs associated with operating and maintaining facilities, program management, and support costs associated with management of other resources.

ORACLE — A relational database management system software package.

Order three inventory	A level of soil surveys made for extensive land uses that do not require precise knowledge of small areas or detailed soils information. Such survey areas are usually dominated by a single land use and have few subordinate uses. This information can be used in planning for range, forest, recreational areas, and similarly extensive land uses and in community planning.
Order four inventory	A soil survey level made for extensive land uses that require general information for broad statements concerning land-use potential and general land management. This information can be used in locating, comparing, and selecting suitable areas for major kinds of land use in regional land-use planning, and in selecting areas for more intensive study and investigation.
Ordinary high water mark	The mark along the bank or shore up to which the presence and action of the nontidal water are common and usual, and so long continued in all ordinary years, as to leave a natural line impressed on the bank or shore and indicated by erosion, shelving, changes in soil characteristics, destruction of terrestrial vegetation, or other distinctive physical characteristics. (Consult 11 AAC 53.900 — Alaska Code.)
Organic soils	Soils which contain a high percentage (greater than 15 percent) of organic matter throughout the soil depth.
ORV	Off-Road Vehicle. (See Off-Highway Vehicle.)
Other forest Land	Unproductive forest land incapable of yielding crops of industrial wood because of adverse site conditions.
Output	The measurable goods, end products, or services resulting from management activities that are purchased, consumed, or used directly by people.
Overflow	High runoff which overflows natural stream and river banks. Also known as flooding.
Overmature	The stage at which a tree declines in vigor and soundness, for example, height growth has usually stopped and probability of mortality is high.
Overselection	Unconveyed lands selected in excess of entitlement. Overselections by the State of Alaska are authorized in Section 906 (f), ANILCA. They are authorized for Native Corporations organized under ANCSA in Federal Regulations (43 CFR 2650).
Overstory	The portion of trees in a forest which forms the upper most layer of foliage.

P

Palustrine wetland	Includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens and all such wetlands that occur intidal areas where salinity due to ocean derived salts is below O.5 percent.
Parent material	The unconsolidated, and more or less chemically weathered, mineral or organic matter from which soils develop.
Partial cut	Any cutting in which only part of the stand is harvested. This may include thinning, selection, shelterwood, or an overstory removal.

Partial retention	See "Visual Quality Objectives."
Parts per million (PPM)	A measurement of concentration indicating the quantity of a substance per unit volume of a solution.
Parturient	Of or relating to giving birth.
Payments to states	A fund consisting of approximately 25 percent of the gross annual timber receipts received by the National Forests in that state. This is returned to the State for use on roads and schools.
Peak flow	The highest discharge of water recorded over a specified period of time at a given stream location. Often thought of in terms of spring snowmelt, summer, fall or winter rainy season flows. Also called maximum flow.
Personal use	Personal use refers to the green or dried timber that residents may harvest free of charge for personal use, and not for sale, from National Forests in Alaska. The amount of material granted to any one person in one year shall not exceed 10,000 board feet of saw timber and 25 cords of wood or an equivalent volume in other forms (36 CFR 223.10).
pH	The degree of soil acidity or alkalinity.
Plan of operations	A plan of operations is required from anyone whose proposed operations, under the 1872 Mining Law, would cause, "significant surface disturbance." It is a document by which mineral operators identify themselves, describe the work they intend to do, where and when they intend to do it, the nature of any proposed disturbance of surface resources, and the steps they will take to protect these resources. An approved plan of operations is basically an agreement between the Forest Service and the operator. The operator agrees to observe necessary and reasonable precautions, spelled out in this plan, to reduce damage to surface resources during operation activities and to rehabilitate disturbed areas as and when feasible. In turn, the Forest Service agrees that protection of surface resources will be adequate if operations are carried out in accordance with the provisions of the approved plan.
Plan period	The period of time a Forest Plan is in effect, normally 10 years, but no longer than 15 years.
Planning area	The area of the National Forest System controlled by a decision document.
Planning horizon	The overall time period considered in the planning process that spans all activities covered in the analysis or plan and all future conditions and effects of proposed actions which would influence the planning decisions.
Planning period	Generally one decade. The time interval within the planning horizon that is used to show incremental changes to yields, costs, effects, and benefits.
Planning records	A system that records decisions and activities that result from the process of developing a forest plan, revision, or significant amendment.
Plant association	Climax plant community type.
Plant communities	A homogeneous unit in respect to the number and relationship of plants in the tree, shrub, and ground cover strata.

Plant communities	Aggregations of living plants having mutual relationships among themselves and to their environment. More than one individual plant community.
Point source (pollution)	A point at which pollution is added to a system, either instantaneously or continuously. An example is a smokestack.
Pole	An immature tree between 5 and 9 inches diameter breast height.
Pollution	The presence of matter or energy whose nature, location, or quantity produces undesired environmental effects.
Pond log value	Selling value minus manufacturing costs. Pond log values are the price a timber buyer would pay for a log at the mill site.
Poorly drained soils	Water in these soils is removed so slowly that the soil remains wet for a large part of the time. The water table is commonly at or near the surface during a considerable part of the year.
Population	The actual number of animals or plants present in an area certain time.
Population viability	Ability of a population to sustain itself.
Positive control	The condition that exists when fish and other mobile species are enclosed in an escape-proof barrier for rearing and other clams (bivalves) or aquatic plants are managed for cultivation in unenclosed water.
Potential yield	The maximum, perpetual, sustained-yield harvest attainable through intensive forestry on regulated areas considering the productivity of the land, conventional logging technology, standard cultural treatments, and interrelationships with other resource uses and the environment.
PPM	See Parts per million.
Practicable	In reference to the Alaska Coastal Management Plan, fully consistent with enforceable policies of approved management programs unless compliance is prohibited based upon the requirements of existing law applicable to the Federal agency's operations.
Present Net Value (PNV)	The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area.
Prescribed fire	A wildland fire burning under planned conditions to accomplish specific land and resource objectives. It may result from either a management or natural ignition.
Preservation	A technique of conservation which maintains the resource in or on the ground in perpetuity.
Prevention of Significant Deterioration (PSD)	The process incorporated in the Clean Air Act which requires emission limitations for certain new or modified sources. (See also Class II Area.)
Primary stream production	Results from photosynthesis by green plants. In streams, includes production from algae and aquatic plants, and from non-stream sources such as leaf litter.

7 Glossary

Primary succession — Vegetation development is initiated on newly formed soils or upon surfaces exposed for the first time (as by landslides) which have, as a consequence, never borne vegetation before. Any succession beginning on a bare area not previously occupied by plants or animals.

Priority use — A Forest Service commitment to the holder of a permit for outfitting and guiding to give priority consideration to granting the holder a specific amount of available future use.

Process Group — A combination of similar channel types based on major differences in landform, gradient and channel shapes.

Programmatic Environmental Impact Statement — The document disclosing the environmental consequences of a program or plan which guides or prescribes the use of resources, allocates resources, or establishes rules and policies in contrast to disclosure of the environmental consequences of a site-specific project.

Proponent — An agency, institution, or individual applying to perform an activity on National Forest System lands under authority of a mining plan of operation, contract, license, special use authorization, or other agreement.

Project — One or more site-specific activities designed to accomplish a specific on-the-ground purpose or result.

PSD — See Prevention of Significant Deterioration.

Public issue — A subject or question of widespread public interest relating to management of the National Forest System.

Public participation — Meetings, conferences, seminars, workshops, tours, written comments, responses to survey questionnaires, and similar activities designed and held to obtain comments from the public about Forest Service planning.

Purchase unit — A unit designated by the Secretary of Agriculture or previously approved by the National Forest Reservation Commission for purposes of Weeks Law acquisition. (USDA Forest Service, undated, Land Areas of the National Forest System)

Purchaser road credit — Credit earned by the purchaser of a National Forest timber sale by construction of contract-specified roads. Earned purchaser credit may be used by the purchaser as payment for National Forest timber removed.

R

Real dollar value — A monetary value which compensates for the effects of inflation.

Reconstruction — Road or trail construction activities which take place on an existing road or trail and raise the standard of the road or trail. This can include relocation of the facility in a completely new location.

Recreation capacity — The number of people that can take advantage of the supply of a recreation opportunity during an established use period without substantially diminishing the quality of the recreation experience or the resources.

Reburial and reinterment

The replacement of disinterred human remains into the ground or otherwise disposing of such remains in a manner likely to approximate the wishes of the deceased (e.g., placement in burial caves, legal cemeteries, surface mortuary structures, or cremation where traditionally practiced).

Recreation Opportunity Spectrum (ROS)

A system for planning and managing recreation resources that categorizes recreation opportunities into six classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skills needed to enjoy the area and the relative density of recreation use. The seven classes are:

Primitive. An unmodified environment generally greater than 5,000 acres in size and located generally at least 3 miles from all roads and other motorized travel routes. A very low interaction between users (generally less than 3 group encounters per day) results in a very high probability of experiencing solitude, freedom, closeness to nature, tranquility, self-reliance, challenge, and risk. Evidence of other users is low. Restrictions and controls are not evident after entering the land unit. Motorized use is rare.

Semi-Primitive Non-motorized. A natural or natural-appearing environment generally greater than 2,500 acres in size and generally located at least 1/2 mile but not further than 3 miles from all roads and other motorized travel routes. Concentration of users is low (generally less than 10 group encounters per day), but there is often evidence of other users. There is a high probability of experiencing solitude, freedom, closeness of nature, tranquility, self-reliance, challenge, and risk. There is a minimum of subtle on-site controls. No roads are present in the area.

Semi-Primitive Motorized. A natural or natural-appearing environment generally greater than 2,500 acres in size and generally located within 1/2 mile of primitive roads and other motorized travel routes used by motor vehicles; but not closer that 1/2 mile from better-than-primitive roads and other motoried travel routes. Concentration of users is low (generally less than 10 group encounters per day), but here is often evidence of other users. There is a moderate probability of experiencing solitude, closeness to nature, and tranquilty along with a high degree of self-reliance, challenge, and risk in using motorized equipment. Local roads may be present, or along saltwater shorelines there may be extensive boat traffic.

Roaded Natural. Resource modification and utilization are evident, in a predominantly naturally-appearing environment generally occuring within 1/2 mile from better-than-primitive roads and other motorized travel routes. Interactions between users may be moderate to high (generally less than 20 group encounters per day), with evidence of other users prevalent. There is an opportunity to affiliate with other users in developed sites but with some chance for privacy. Self-reliance on outdoor skills is only of moderate importance with little opportunity for challenge and risk. Motorized use is allowed.

Roaded Modified. Vegetative and landform alterations typically dominate the landscape. There is little on-site control of users except for gated roads. There is moderate evidence of other users on roads (generally less than 20 group encounters per day), and little evidence of others or interactions at campsites. There is opportunity to get away from others but with easy access. Some self-reliance is required in building campsites and use of motorized equipment. A feeling of independence and freedom exists with little challenge and risk. Recreation users will likely encounter timber management activities.

Rural. The natural environment is substantially modified by land use activities. Opportunity to observe and affiliate with other users is important as is convenience of facilities. There is little opportunity for challenge and risk and self-reliance on outdoor skills is of little importance. Recreation facilities designed for group use are compatible. Users may have more that 20 group encounters per day.

Urban. Urbanized environment with dominat structures, traffic lights and paved streets. May have natural appearing backdrop. Recreation places may be city parks and large resorts. Opportunity to observe and affiliate with other users is very important as is convenience of facilities and recreation opportunities. Interaction between large numbers of users is high. Outdoor skills, risk, and challenge are unimportant except for competive sports. Intensive on-site controls are numerous.

Recreation places — Identified geographical areas having one or more physical characteristics that are particularly attractive to people engaging in recreation activities. They may be beaches, streamside or roadside areas, trail corridors, hunting areas of the immediate area surrounding a lake, cabin site, or campground.

Recreation Visitor Day (RVD) — A measure of recreation use of an area. One recreation visitor day consists of 12 hours of recreation use of a site or area. Recreation visitor days are used to measure recreation production or output capacity.

Reducing soil condition — An environment in the soil conducive to the removal of oxygen and chemical reduction of ions caused by saturated soil conditions.

Reforestation — The natural or artificial restocking of an area usually to produce timber and other wood products, but also to protect watersheds, prevent soil erosion, and improve wildlife, recreation and other natural resources. Natural reforestation includes site preparation to reduce competing vegetation and provide a mineral seed bed for seed provided by seed trees. Artificial reforestation is the planting of seedlings, cuttings or seeds by hand or mechanical means and may include site preparation.

Regeneration treatment — Treatments and activities that relate to the reestablishment of stands of trees. Includes planting, seeding, and preparing the ground for seeding from adjacent stands where ground preparation is not necessary.

Regulated volume — The quantity of timber in the allowable sale quantity that is based on the growth and yield projections for growing stock.

Rehabilitation — Actions taken to protect or enhance site productivity, water quality, or other values for a short period of time.

Relinquish — To abandon, to give up, to surrender, to renounce some right or thing (Black 1979).

Research and Experiment Area — A unit reserved and dedicated by the Secretary of Agriculture for forest or range research and
experimentation. (USDA Forest Service, undated, Land Areas of the National Forest System)

Research design — A statement of work to be done toward a particular goal. The research design details what will be done, how it will be done, what is required to do it, and why it is important or useful to do the work .

Research Natural Area (RNA) — An area in as near a natural condition as possible, which exemplifies typical or unique vegetation and associated biotic, soil, geologic, and aquatic features. The area is set aside to preserve a representative sample of an ecological community primarily for scientific and educational purposes; commercial and most public uses are not allowed.

Reserve — A general term for an area of land recognized for, and managed to preserve or maintain, specific natural features. Wilderness is one common example. In the context of wildlife or fish habitat management, or biological diversity, an area set aside for the maintenance and perpetuation of its habitat or ecosystem features. (See also habitat conservation areas.)

Reserve trees — Live or dead trees that are retained for various resource objectives such as wildlife, structural diversity, etc.

Resident fish — Fish that are not migratory and complete their entire life cycle in fresh water.

Resource values — The tangible and intangible worth of forest resources.

Responsible Official — The Forest Service employee who has the delegated authority to make a specific decision.

Restoration — The long-term placement of land back into its natural condition or state of productivity.

Retention — The amount of commercial forest land removed from the timber base to protect other resource values.

Revegetation — The re-establishment and development of a plant cover. This may take place naturally through the reproductive processes of the existing flora or artificially through the direct action of reforestation or reseeding.

Riffles — Shallow rapids in an open stream, where the water surface is broken by waves caused by wholly or partially submerged obstructions.

Right-of-Way — An easement, license, or permit to pass through another person's land. It does not grant an estate of any kind, only the right to use.

Riparian area — The area including a stream channel, lake or estuary bed, the water itself, and the plants that grow in the water and on the land next to the water.

Riparian ecosystem — Land next to water where plants that are dependent on a perpetual source of water occur.

Riparian management area — The area including water, land and plants that is at least 100 slope feet away from each side of perennial streams, lakes and other bodies of fresh water.

Riverine wetland — A category in wetland classification which includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5 percent.

7 Glossary

RNA — See Research Natural Area.

Road density — The number of road miles per square mile of land area.

Roadless area — An area of undeveloped public land within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.

Road Maintenance Level — Defines the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria (FSH 7709.58, section 12.3).
Maintenance Level 1. Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period is one year or longer. Basic custodial maintenance is performed.
Maintenance Level 2. Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration.
Maintenance Level 3. Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities.
Maintenance Level 4. Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds.
Maintenance Level 5. Assigned to roads that provide a high degree of user comfort and convenience. Normally, roads are double-laned and paved, or aggregate surfaced with dust abatement.

ROS — See Recreation Opportunity Spectrum.

ROS Existing — See ROS Inventoried.

ROS Inventoried — A general inventory of the physical, social and managerial setting for recreation, based on remoteness from modern human development and activity, modification of the land, and social factors such as crowding.

Rotation — The planned number of years between the formation or the regeneration of a crop or stand of trees and its final cutting at a specified stage of maturity.

Rotation age — The age of a stand when harvested at the end of a rotation.

RPA — Forest and Rangeland Renewable Resources Planning Act.

RPA Assessment and Program — The RPA Assessment is prepared every ten years and describes the potential of the nation's forests and rangelands to provide a sustained flow of goods and services. The RPA Program is prepared every five years to chart the long-term course of Forest Service management of the National Forests, assistance to State and private landowners, and research. They are prepared in response to Sections 3 and 4 of the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) (16 U.S.C. 1601).

Rubble — All accumulations of loose angular rock fragments, commonly overlying outcropping rock.

Rural development — Rural Development is the management of human, natural, technical, and financial resources needed to improve living conditions, provide employment opportunities, enrich the cultural life, and enhance the environment of rural America. In the National Forest System, rural development is accomplished through partnerships.

S

Saleable minerals Include common varieties of sand, stone, gravel, pumice, pumicite, cinders, and clay. In general, these minerals are of wide-spread occurrence and are of relatively low unit value. They are generally used for construction materials and for road building purposes.

Salvage harvest Removal of dead or dying trees resulting from insect and disease epidemics or wildfire.

Saturated soils Soil condition where all the spaces between soil particles are filled with water.

Sawlogs (Sawtimber) That portion of a tree that is suitable in size and quality for the production of dimension lumber collectively known as sawtimber.

Scoping Determination of the significant issues to be addressed in an environmental impact statement.

Scree An accumulation of loose stones or rock debris lying on a slope or at the base of a cliff.

Scrub-Shrub wetland Wetlands dominated by woody vegetation less than 20 feet tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. In Southeast Alaska this includes forested lands where trees are stunted because of poor soil drainage.

Second growth Forest growth that has come up naturally or has been planted after some drastic interference (for example, clearcut harvest, serious fire, or insect attack) with the previous forest growth.

Secondary stream production Results from consumption by animals of materials produced in primary production in streams; this includes production of macroinvertebrates and some fish species.

Secondary succession The process of reestablishing vegetation after normal succession is disrupted by fire, cultivation, lumbering, windthrow, or any similar disturbance.

Sediment Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

Seed tree Small number of seed-bearing trees left singly or in small groups after timber harvest to provide seed for regeneration of the site.

Selection cutting The annual or periodic removal of trees (particularly the mature), individually or in small groups from an uneven-aged forest to achieve the balance among diameter classes needed for sustained yields, and in order to realize the yield, and establish a new crop of irregular constitution. Note: The improvement of the Forest is a primary consideration.

Selection system A silviculture system in which trees in an uneven-aged stand are removed individually, here and there, from a large area each year in order to achieve a balance among diameter classes needed for sustained yield by selection cutting.

Sensitive species	Plant or animal species which are susceptible or vulnerable to activity impacts or habitat alterations. Species that have appeared in the Federal Register as proposed for classification and are under consideration for official listing as endangered or threatened species, that are on an official state list, or that are recognized by the Regional Forester as needing special consideration to assure viable populations and to prevent their being placed on Federal or state lists.
Sensitive travel route	A road system or marine water way which receives a moderate to high degree of use by the public, both Alaskan residents and tourists.
Sensitivity level	A measure of the people's concern for the scenic quality of the National Forest applied to travel routes, use areas, and water bodies.
Sensitivity zone	A body of land which has been classified on the basis of cultural and environmental data, as having a high, medium, or low likelihood for containing cultural resources.
Settlement sale	The disposition of timber or other national forest products, cut, damaged or destroyed in conjunction with an authorized occupancy of a right-of-way or other use of National Forest Land. In wilderness it would be the sale of timber removed from an inholding access road or privately developed hatchery site. Also, the compensation of the United States for property taken or rendered unusable for other purposes incidental to some lawful use of National Forest land. When timber has a value, clearing the land for some use other than growing timber constitutes a forced sale.
Shelterwood harvest	The removal of a stand of trees through a series of cuttings designed to establish a new crop with seed and protection provided by a portion of the stand.
SHPO	See State Historic Preservation Officer.
Significant change	(Soils) Change in productivity of the land as indicated by changes in soil properties that are expected to result in a reduced productive capacity over the planning horizon. Based on available research and current technology, a guideline of 15 percent reduction in inherent soil productivity potential is used as a basis for setting threshold values for measurable or observable soil properties or conditions. The threshold values, along with areal extent limits, will serve as an early warning signal of reduced productive capacity. A more stringent basis than 15 percent can be used where appropriate and documented.
Significant impairment	(Soils) Changes in the productivity of the land as indicated by changes in soil properties which would result in significant changes in the inherent productive capacity that last beyond the planning horizon.
Silvicultural system	A management process whereby forests are tended, harvested, and replaced resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the process (See single-tree selection, shelterwood cutting, group selection, even-aged management, uneven-aged management, and clearcut).
Silviculture	The science and art of growing and tending crops of forest trees to attain the desired level of marketable and unmarketable products.

Significant surface disturbance — Changing the above-ground environment so much that returning that site to the condition it was in before the change is difficult or impossible. Road construction, use of mechanical earthmoving equipment including backhoes and bulldozers, construction of buildings, and cutting of timber are all examples of activities that are considered to cause significant disturbance to surface resources. An evaluation of proposed operations must be made on a case by case basis to determine if disturbance is considered significant. For example, a mining activity in an alpine area may result in significant disturbance that takes years to reclaim while the same activity conducted at a lower elevation where natural conditions are not as severe may result in a disturbance that would take only a few months to successfully reclaim.

Single-tree selection — A cutting method to develop and maintain uneven-aged stands by removal of selected trees from specified age classes over the entire stand area in order to meet a predetermined goal of age distribution and species in the remaining stand.

Site index — A measure of the relative productive capacity of an area for growing wood. Measurement of site index is based on height of the dominant trees in a stand at a given age.

Site preparation — Removing unwanted vegetation and debris from a site and preparing the soil before reforestation.

Site productivity — Production capability of specific areas of land.

Skyline logging — See “Logging systems”.

Slash — Debris left after logging, pruning, thinning, or brush cutting, and large accumulations of debris resulting from windstorms. It includes logs, bark, branches, and stumps.

Slope distance — Distance measured along the contour of the ground.

Slough — A section of an abandoned river channel containing stagnant water and occurring on a floodplain or delta.

Smolt — A young silvery-colored salmon or trout which moves from freshwater streams to saltwater.

Snag — A non-living standing tree usually greater than 5 feet tall and 6 inches in diameter at breast height. The interior of the snag may be sound or rotted.

Soil conservation practices — Practices that are mechanisms used to protect soil quality while managing for other resource goals and objectives. They can be administrative, preventive or corrective measures. They are identified during project planning and design.

Soil drainage — The rapidity and extent of the removal of water from the soil, in relation to additions especially by surface runoff and by flow through the soil to underground spaces.

Soil mass movement — See mass movement.

Soil productivity — The capacity of a soil, in its normal environment, to produce a specific plant or sequence of plants under a specific system of management.

Soil quality standards Standards that are a combination of 1) "threshold" values for severity of soil property alteration, or significant change in soil properties conditions, and 2) areal extent of disturbance.

Soil Resource Inventory (SRI) An inventory of the soil resource based on landform, vegetative characteristics, soil characteristics, and management potentials.

Somewhat poorly drained soil Water in the soil is removed from the soil slowly enough to keep it wet for significant periods but not all of the time.

Special habitats Structural elements of ecosystems. These may include, but are not limited to: snags, spawning gravels, fallen trees, aquatic reefs, caves, seeps, and springs.

Special Interest Areas A designation for areas possessing unique or unusual scenic, historic, preshistoric, scientific, or other characteristics.

Special Use Authorization A permit, term permit, temporary permit, lease, or easement that allows occupancy or use of, or rights and privileges on National Forest System lands.

Special Use Permit Permits and granting of easements (excluding road permits and highway easements) authorizing the occupancy and use of land.

Specified Road Those roads including related transportation facilities and appurtenances, listed in timber sale contracts (Table A1) for construction or reconstruction by the timber purchaser in accordance with locations and specifications provided by the Forest Service. Those Forest Development roads planned for recurrent land management uses and for which the timber sale contract species the location, standards, and specifications.

Speleothem Any secondary mineral deposit or cave formation that is formed by the action of water. Examples are stalagmites, stalactites, flow stone, bacon rind drapery, helictites, soda straws, and crystal growths.

Split lines The process of separating the direction of timber harvest yarding into opposite directions.

SRI See Soil Resources Inventory.

Stabilization The process of arresting the deterioration of a damaged cultural resource in order to prevent further damage from occurring. Stabilization may include reconstructing portions of the cultural resource.

Stand A group of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition as to be distinguishable from the trees in adjoining areas.

Standard A course of action or level of attainment required by the forest plan to promote achievement of goals and objectives.

State Historic Preservation Officer (SHPO) The official appointed or designated pursuant to Section 101(b)(1) of the National Historic Preservation Act of 1966, as amended, to administer the State Historic Preservation Program.

State selection (from National Forest System lands) Application by Alaska Department of Natural Resources to the USDI Bureau of Land Management for conveyance of a portion of the 400,000 acre State entitlement from vacant and unappropriated National Forest System lands in Alaska, under authority of Section 6(a) of the Alaska Statehood Act of 1959 (Public Law 85-508, 72 Stat. 340). For lands to be conveyed, State selections must be approved by the USDA Forest Service, Regional Forester, Alaska Region under criteria of the Statehood Act. Until approved by the Regional Forester, the State application is not considered a valid selection. The State can select up to 25 percent in excess of its remaining entitlement.

Strata The aggregation of areas with similar resource conditions into broad categories for analysis purposes. The term is most commonly used for categorizing forested areas.

Stratigraphic Depositional units or layers of sediment distinguished by composition or appearance that are associated with archaeological and historic sites.

Stream class A means to categorize stream channels based on their fish production values. There are three stream classes on the Tongass National Forest. They are:
Class I. Streams with anadromous (fish ascending from oceans to breed in freshwater) or adfluvial (fish ascending from freshwater lakes to breed in streams) lake and stream fish habitat. Also included is the habitat upstream from migration barriers known to be reasonable enhancement opportunities for anadromous fish and habitat with high value resident sport fish populations.
Class II. Streams with resident fish populations and generally steep (often 6-15 percent) gradient (can also include streams from 0-5 percent gradient where no anadromous fish occur). These populations have limited sport fisheries values. These streams generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use.
Class III. Streams with no fish populations but have potential water quality influence on the downstream aquatic habitat.

Streamflow The discharge of water from a watershed that occurs in a natural stream channel.

Stream order First order streams are the smallest unbranched tributaries; second order streams are initiated by the point where two first order streams meet; third order streams are initiated by the point where two second order streams meet, and so on.

Structure A term in ecology referring to the arrangement of plant communities or ecosystems across a landscape and how they are connected, and to variations in tree heights and diameters within a stand or between stands.

Subsistence Section 803 of the Alaska National Interest Lands Conservation Act defines subsistence use as, "the customary and traditional uses by rural Alaska residents of wild renewable resources for direct, personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade."

Substrate The size of rock in the bed (bottom) of rivers and streams.

Suitable forest land Forest land for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions, and for which there is reasonable assurance that such lands can be adequately restocked,

and for which there is management direction that indicated that timber production is an appropriate use of that area.
scheduled lands. Land suitable and scheduled for timber production and which are in the land base for the calculation of the allowable sale quantity and long-term sustained yield timber capacity.
unscheduled lands. Lands suitable but not scheduled for timber production and which are not in the land base for the calculation of the allowable sale quantity nor long-term sustained yield timber capacity.

Supplemental Funds Funds or materials used to finance the additional cost of a road to a higher standard than is needed for a timber sale, and which cannot be legally paid for by purchaser credits.

Suppression The act of extinguishing or confining a fire.

Surface rights All rights in the surface of the land except oil, gas, and other mineral or subsurface rights.

Suspended sediment The very fine soil particles which remain in suspension in water for a considerable period of time without contact with the stream or river channel bottom.

Sustained yield The amount of renewable resources that can be produced continuously at a given intensity of management.

Swale A slight, marshy depression in generally level land. A depression in glacial ground moraine.

T

Targets Objectives assigned to the Forest by the Regional Plan.

Temporary facility Any structure or other human-made improvement which can be readily and completely dismantled and removed from the site when the authorized use terminates.

Temporary roads Low-level roads constructed for a single purpose and short-term use. Once use of the road has been completed, it is obliterated, and the land it occupied is returned to production.

Tentatively suitable Forest Land Forest land that is producing or is capable of producing crops of industrial wood and: (a) has not been withdrawn by Congress, the Secretary of Agriculture or the Chief of the Forest Service; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity, or watershed conditions; (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that it is possible to restock adequately within 5 years after final harvest; and (d) adequate information is available to project responses to timber management activities.

Terrestrial ecosystems Plant communities that are not dependent on a perpetual source of water to grow.

Thinning The practice of removing some of the trees in a stand so that the remaining trees will grow faster due to reduced competition for nutrients, water, and sunlight. Thinning

may also be done to change the characteristics of a stand for wildlife or other purposes. Thinning may be done at two different stages:
Precommercial. Removing trees that are too small to make a merchantable product to improve tree spacing and promote more rapid growth.
Commercial. Removing trees that have reached sufficient size to be manufactured into a product to improve tree spacing and promote more rapid growth.

Threatened Species Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of the Interior as a threatened species.

Threshold The point or level of activity beyond which an undesirable set of responses begins to take place within a given resource system.

Tiering Elimination of repetitive discussions of the same issue by incorporating by reference the general discussion in an environmental impact statement of broader scope. For example, a project environmental assessment could be tiered to the Forest Plan EIS.

Timber A general term for the major woody growth of vegetation in a forest area.

Timber classification Forested land is classified under each of the land management alternatives according to how it relates to the management of the timber resource. The following are definitions of timber classifications used for this purpose.
Nonforest. Land that has never supported forests and land formerly forested where use for timber production is precluded by development or other uses.
Forest. Land at least 10-percent stocked (based on crown cover) by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.
Suitable. Land to be managed for timber production on a regulated basis.
Unsuitable. Forest land withdrawn from timber utilization by statute or administrative regulation (for example, wilderness), or identified as inappropriate for timber production in the Forest planning process.
Commercial forest. Forest land tentatively suitable for the production of continuous crops of timber and that has not been withdrawn.

Timber dispersion When a opening created from a final timber harvest is no longer considered an opening for the purpose of scheduling adjacent timber harvest. This is often expressed as the maximum amount of disturbance in a watershed at any given time.

Timber harvest schedule The quantity of timber planned for sale and harvest, by time period, from the area of land covered by the Forest Plan.

Timberlands Forest lands producing or capable of producing crops of industrial wood. Areas qualifying as timberland can produce more than 20 cubic feet per acre per year of industrial wood at culmination of mean annual increment.

Timber production The purposeful growing, tending, harvesting, and regeneration of trees for industrial or consumer use.

Timber Stand Improvement (TSI) All noncommercial intermediate cuttings and other treatments to improve composition, condition, and volume growth of a timber stand.

Timed Meander

A proven floristic survey method where the surveyor enters the field, records the time, and records all species, while moving through the unit in a meandering search path covering all habitat variations. If after a certain time no new species are found, the survey is considered complete.

Tongass Resource Use Cooperative Survey(TRUCS)

A study done to gather information on subsistence uses of the Forest.

Top filing

The filing of a future selection application by the State of Alaska, subject to valid existing rights, for lands which are not available for selection on the date of filing. If otherwise valid, these applications become an effective selection, without further action by the state, upon the date included lands become available for selection. Top filings for the State of Alaska are authorized by Section 906(e), ANILCA.

Total stream discharge

Total water outflow from stream or river.

Traffic Service Level (TSL)

Describes a road's significant traffic characteristics and operating conditions. The levels reflect a number of factors, such as speed, travel time, traffic interruptions, freedom to maneuver, safety driver comfort, convenience, and operating costs. These factors, in turn, affect design elements such as number of lanes, turnout pacing, lane widths, type of driving surface, sight distances, design speed, clearance, horizontal and vertical alignment, curve widening, and turnarounds.
TSL A. Reflects transportation efficiency and mobility with few interruptions to flow and a stable smooth driving surface.
TSL B. Generally would have alignment more influenced by topography, more interruptions but still usually a stable smooth driving surface.
TSL C. One could expect much more sinuous alignment to reduce construction costs with a surface that may not be stable under all traffic or weather conditions.
TSL D. Generally constructed for a single purpose and traffic is discouraged for other purposes; surface and alignment is rough and irregular; very low speeds are anticipated to be able to safely negotiate the road.

Transportation and Utility System (TUS)

Significant corridors, with their associated sites used to accommodate public transportation and energy transmission needs.
Avoidance Area. An area where the establishment and use of transportation or utility corridors and sites is not desirable given the land use designation emphasis. A search for "windows" should be exhausted before TUS facilities are considered in avoidance areas. When practical, these areas should be avoided through site-specific analysis during project-level planning. Avoidance areas often include Congressionally and administratively designated areas. Although special environmental and procedural considerations may be required for these areas, these special designations do not preclude consideration and use as a TUS. Avoidance areas are designated through the allocation of lands to management prescriptions specifically identified as TUS avoidance areas in their standards and guidelines.
Exclusion Area. A large area (large enough to cause significant barriers) which legislatively precludes transportation and utility systems. Due to special authorities provided in Title XI, ANILCA, there will be no exclusion areas on the Tongass.
Window. An area potentially available for the location of transportation or utility corridors and sites.

Transportation/Utility corridor	A linear strip of land identified for the present location of transportation or utility rights-of-way within its boundaries (USDA Forest Service, Region 6 memo dated December 2, 1987 from Director of Lands and Minerals to Director of Planning).
Travel management	Providing for the safe, environmentally responsible, and customer responsive movement of vehicles and people to and through public lands (social attributes).
TRUCS	See Tongass Resource Use Cooperative Survey.
Trust	A right of property, real or personal, held by one party for the benefit of another (Black 1979).
TSI	See Timber Stand Improvement.
TSL	Traffic Service Level.
TTRA	Tongass Timber Reform Act of 1990.
Turbidity	An expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines through a water sample; turbidity in water is caused by the presence of suspended matter such as clay, silt, finely divided organic and inorganic matter, plankton, and other microscopic organisms.
TUS	See Transportation and Utility System.
Two-aged Management	A silvicultural method in which the majority of the trees in a harvest unit are cut in one entry, and the rest (about 10-20 percent of the unit) are left as residual trees, either singly or in patches. The residual trees remain unharvested to provide structural diversity and older-aged trees within the second-growth stand.
Type conversion	The act of converting a plant community from one vegetative type to another. In forestry, it is the act of changing the existing dominant tree species from one type to another.

U

Ultramafic soil	A soil that is very low in silica and rish in iron and magnesium.
Unconfined streams	Streams that, due to lack of stream incision, and effects of geomorphic landform characteristics and local geologic conditions, result in streams overflowing their banks, changing flows to other channels, and establishing new channels during flood conditions.
Understory vegetation	Grass, small trees, shrubs, and other plants found beneath the overstory (the trees comprising the forest).

Undertaking — In cultural resources, any project, activity, or program that can result in changes in the character or use of historic properties, if any such properties are located in the area of potential effects. The project, activity, or program must be under the direct or indirect jurisdiction of a Federal Agency or be licensed or assisted by a Federal agency. Undertakings include new and continuing projects, activities, or programs and any of their elements not previously considered under Section 106, National Historic Preservation Act of 1966, as amended.

Uneven-aged management — The application of actions needed to maintain high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single-tree and group selection.

Unsuitable lands — Forest land not managed for timber production because: 1) Congress, the Secretary, or the Chief has withdrawn it; 2) it is not producing or capable of producing industrial wood; 3) technology is not available to prevent irreversible damage to soils productivity, or watershed conditions; 4) there is no reasonable assurance, based on existing technology and knowledge, that it is possible to restock lands within 5 years after final harvest; 5) there is, at present, a lack of adequate information about responses to timber management activities; or 6) timber management is inconsistent with or not cost efficient in meeting the management requirements and multiple-use objectives specified in the Forest Plan.

Unsuppressed — A fire that remains unextinguished or unconfined. The spread has not been halted.

Upland — Not immediately adjacent to a stream.

Utility (Pulp) volume — Logs that do not meet minimum requirements for sawtimber but are suitable for the production of usable pulp chips.

Utilization standards — Standards guiding the use and removal of timber. They are measured in terms of diameter at breast height (DBH) and top of the tree inside the bark (top DIB) and the percentages of “soundness” of the wood.

V

V-Notches — A deeply incised valley along some waterways that would look like a “V” from a frontal view. These abrupt changes in terrain features are often used as harvest unit or yarding boundaries.

VAC — See Visual Absorption Capability.

Valid — Having legal strength or force, executed with proper formalities, incapable of being rightfully overthrown or set aside (Black 1979).

Valid existing rights — The rights afforded someone to explore and extract minerals from an area that has been withdrawn from mineral entry because they staked their claim before the area was withdrawn.

Valley — An elongated, relatively large, externally drained depression of the earth's surface that is primarily developed by stream erosion.

Valley bottom — A general term for the nearly level to gently sloping part of a valley. Also referred to as the valley floor.

Value Comparison Unit (VCU) — A distinct geographic area that generally encompasses a drainage basin containing one or more large stream systems. Boundaries usually follow easily recognizable watershed divides. These units were established to provide a common set of areas for which resource inventories could be conducted and resource value interpretations made.

VCU — See Value Comparison Unit.

Vegetation release — The freeing of vegetation (grass, forbs, brush, trees) by eliminating the competition for nutrients, water, and sunlight. Once competition for these items has been eliminated, subdued, or stagnated, vegetation will display vigor and growth.

Veneer log — A log considered suitable in size and quality for producing veneer which is a thin sheet of wood of uniform thickness.

Very poorly drained soils — Water is removed from the soil so slowly that the water table remains at or on the surface the greater part of the time. Soils of this drainage class usually occupy level or depressed sites and are frequently ponded.

Viable population — The number of individuals of a species required to ensure the long-term existence of the species in natural, self-sustaining populations adequately distributed throughout their region.

Viewshed — An expansive landscape or panoramic vista seen from a road, marine water way or specific viewpoint.

Visual Absorption Capability (VAC) — The capability of the landscape to visually absorb management activities. Landscapes are rated with high, moderate or low abilities to absorb management activities. These ratings reflect the degree of landscape variety in an area, viewing distance and topographic characteristics. As an example, steep, evenly sloped landscapes viewed in the foreground to middleground are typically given a low VAC rating.

Visual Quality Objective (VQO) — A desired level of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations of the characteristic landscape.
Inventory VQO. Derived through application of the USDA Visual Management System. Uses three elements to determine the inventory: Sensitivity levels, distance zones and landscape variety class. Provides a benchmark and illustrates the optimum objective based on current use patterns and sensitivity.
Adopted VQO. The VQO to be achieved as a result of management direction identified in the approved forest plan. Adopted VQO's represent the visual resource objective for the Forest Land Management Plan period, normally 10 years. (FSH 2309.22, R-10 Landscape Management Handbook.)
Preservation. Management activities are generally not allowed in this setting. The landscape is allowed to evolve naturally.
Retention. Management activities are not evident to the casual Forest visitor.
Partial Retention. Management activities may be evident, but are subordinate to the characteristic landscape.

Modification. Management activities may dominate the characteristic landscape but will, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed as middleground (1/4 to 5 miles from viewer).
Maximum Modification. Management activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

VQO — See Visual Quality Objective.

W

WAA — See Wildlife Analysis Area.

Watershed — The area that contributes water to a drainage or stream. Portion of the forest in which all surface water drains to a common point. Watersheds can range from a few tens of acres that drain a single small intermittent stream to many thousands of acres for a stream that drains hundreds of connected intermittent and perennial streams.
Third order watershed. A watershed where there are (generally) two major branches to the mainstream of the watershed. (Also see Stream order.)
Fourth order watershed. A watershed which contains at least two third order watersheds.

Watershed analysis — A systematic procedure for characterizing and evaluating ecological processes within a watershed, for use in ecosystem management and project planning.

Water table — The upper surface of the ground water or that level below which the soil is saturated with water.

Well distributed — As used in the National Forest Management Act regulations, this term applies to populations of individual wildlife species that occur throughout their geographic range and have the ability to interact with one another across that range.

Well-drained soils — Water is removed from the soil readily, but not rapidly.

Wetlands — Areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include muskegs, marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs.

WFUD — See Wildlife and Fish User Day.

Wild and Scenic Rivers — Rivers or sections of rivers designated by congressional actions under the 1968 Wild and Scenic Rivers Act, as wild, scenic, or recreational by an act of the Legislature of the State or States through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:
Wild river areas. Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
Scenic river areas. Rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational river areas. Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Wilderness

Areas designated by congressional action under the 1964 Wilderness Act or subsequent Acts. Wilderness is defined as undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature, with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and confined type of recreation; include at least 5,000 acres or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historic value as well as ecologic and geologic interest. In Alaska, Wilderness has been designated by ANILCA and TTRA.

Wildfire

Any wildland fire not designated and managed as a prescribed fire within an approved prescription. All wildfires will be given an appropriate suppression action.

Wildlife Analysis Area

A division of land used by the Alaska Department of Fish and Game for wildlife analysis.
(WAA)

Wildlife and Fish User Day (WFUD)

One Wildlife and Fish User Day (WFUD) consists of 12 hours of recreation viewing or utilizing fish or wildlife.

Wildlife habitat diversity

The distribution and abundance of different plant and animal communities and species within a specific area.

Windfirm

Trees not likely to be blown over by the wind. These are usually trees that have been exposed to the wind throughout their life and have developed a strong root system or trees that are protected from the wind by terrain features.

Windthrow

The act of trees being uprooted by the wind. In Southeast Alaska, Sitka spruce and hemlock trees are shallow rooted and susceptible to windthrow. There are generally three types of windthrow - endemic where individual trees are blown over; catastrophic where a major windstorm can destroy hundreds of acres; and management related, where the clearing of trees in an area make the adjacent standing trees vulnerable to windthrow.

Winter range

An area, usually at lower elevation, used by big game during the winter months; usually smaller and better-defined than summer ranges.

Withdrawal

The withholding of an area of Federal land from settlement, sale, location, or entry under some or all of the general land laws for the purpose of limiting activities under those laws in order to maintain other public values in the area.

Appendices

Appendix A

Current Plan Land Use Designations

APPENDIX A

Land Use Designations Used in the Tongass Land Management Plan

(as amended Winter 1985-86)

Land Use Designation I (Wilderness)

Purpose:

The original purpose of this desgination was to recommend areas for inclusion in the National Wilderness Presercation System. Areas designated by the Congress in 1980 under ANILCA as Wilderness will be managed as directed by the 1964 Wilderness Act, as amended.

Management Implication:[1]

Hunting, fishing, and trapping are permitted, subject to State Fish and Game regulations.

These areas were closed to mineral entry on December 31, 1983. Claims with valid existing rights may be accessed and developed.

Scientific studies designed to enhance the wilderness resource may be conducted.

Commercial timber harvesting is not permitted. Beach log salvage, emergency cutting of trolling poles, and subsistence use of timber, where other sources are not available is permitted.

A limited number of new cabins and shelters may be built where necesary to protect the public health and safety.

Public use of snowmachines, motorboats, and airplanes is permitted; however, restrictions may be imposed on a case-by-case basis if such use becomes excessive.

Fish habitat enhancement activities are generally permitted. Wildlife habitat manipulation designed to enhance wilderness recource may be permitted.

New roads are not permitted, except to access valid mining claims.

New water projects can only be cuthorized by the President.

Access to private, State, and Native lands is provided for. Structures and facilities under special use permit may continue to be maintained. These include the electronic sites listed in Appendix F of the 1986 amendment.

Commercial Outfitter and Guide operations which are compatible with wilderness may be permitted.

LUD I Variations:

a. *Areas Released from Wilderness Recommendation (LUD I)*

These areas were considered by Congress for Wilderness designaton during the development of ANILCA. Tje Congress decided not to include these lands in the national Wilderness Preservation System, thu directing their releas from LUD I status. The allocation of these areas to Land Use Designations will be determined through the land management planning process when this Plan is revised. In the interim, these areas will be managed to permit their consideration for the full range of LUDs (including LUD I).

b. *Non-wilderness National Monument Lands*

These lands, although not subject to provisions and requirement of the National Wilderness Preservation System, will be managed to protect objects of ecological, cultural, geological, historical, prehistorical, and scientific interest. Harvesting of timber for commercial purposed is not permitted except as necessary to allow for development of mineral development and, although withdrawn from further mineral entry, makes provisions for continued prospecting on land within 3/4 mile of valid mining claims established by December 2, 1985.

Land Use Designation II

Purpose:

Areas allocated to LUD II are to be managed in a roadless state to retain their wildland character, but this would permit wildlife and fish habitat improvement and primitive recreational facility development.

Management Implications:

Commercial timber harvesting is not permitted. Timber can be salvaged only to prevent significant damage to other resources. Examples are removal of windfall in an important fish stream or control of an epidemic insect infestation.

Personal use of wood is allowed for cabin logs, fuelwood, float logs, trolling poles, and other similar uses.

Water and power developments are permitted if they can be designed to retain the overall primitive characteristics of the allocated area.

Roads will not be built except to serve authorized activities such as mining, power, and water developments, aquaculture developments, transportation needs determined by the State of Alaska, and vital Forest transportation system linkages.[2]

Mineral development is subject to existing laws and regulations.

Use of snowmobiles, motorboats and airplanes on freshwater is permitted; however, restrictions may be imposed on a case-by-case basis if such use becomes excessive.

Permanent improvements such as fishways, fish hatcheries, or aquaculture sites may be built. Appropriate landscape management techniques will be applied in the design and construction of such improvements to minimize impacts on recreation resources.

Major concentrated recreation facilities will generally be excluded.

Land Use Designation III

Purpose:

Areas allocated to LUD III are to be managed for a variety of uses. the mephasis is on managing for both amenity and commodity oriented uses in a compatible manner to provide the greatest combination of benefits. These areas usually have high amenity values in conjunction with high commodity va;ues. Allowances in calculated potential timber yield have been made to meet multiple-use coordination objectives.[3]

Management Implication:

Potential timber yields will be reduced to the extent needed to protect important biological and aesthetic values.

Both permanent and temporary roads are allowed.

Roads are located and designed to retain important recreational and scenic qualities.

Mineral development is subject to existing laws and regulations.

Needed trails can be provided.

A full range of recreational facilities is permissible.

A full range of fisheries improvement projects is permitted.

LUD III Special

Areas to be Managed with a LUD III Emphasis but Excluded from Calculation of Timber Yield.

The purpose of this variation is to minimize impacts on visual and recreation resources in reas directly adjacent to communities. It is similar to LUD III except that any timber management activities (e.g. fire wood sales, free use for house logs, etc.) will be compatible with local recreation and visual resource uses. The timber sold does not contribute to attainment of the Plan's allowable sale quantity.

Land Use Designation IV

Purpose:

Areas allocated to LUD IV provide opportunities for intensive development of resources. Emphasis is primarily for commodity, or market resources and their use. Amenity values are also provided for. When conflicts over competing resource uses arise, conflicts would most often be resolved in favor of commodity values. Allowances in calculated potential timber yield have been made to provide for protection of physical and biological productivity.[3]

Management Implications:

Timber will be harvested primarily by clearcutting.

Potential timber yield will be reduced only to the extent necessary to protect biological and aesthetic values.

Mineral development is subject to existing laws and regulations.

Permanent or temporary roads may be built.

Motorized use is permitted.

A full range of recreation facilities is permitted.

A full range of fisheries improvement projects is permitted.

Needed trails will be provided.

[1]See Forest Service Manual (FSM), Alaska Region Supplement and completed Wilderness management plans for more detailed management implications.

[2] Vital Forest transportation system linkages refer to necessary additions to the permanent road network. Such linkages may be built through LUD II areas when either no other feasible land or water routes exist to access adjacent LUD III or LUD IV areas or when it can be demonstrated that the routing through the LUD II area is clearly environmentally preferable and site-specific mitigation measures can be designed to minimize the impact of the road on the surrounding LUD II area. A clear need to build such linkages must be demonstrated through a comparative analysis of practicable transportation alternatives during the NEPA process and must be approved by the Area Forest Supervisor, in consultation with the other Tongass Forest Supervisors.

[3] These allowances refer to the effect of using the Retention Factors Method described in Appendix A of the 1984 TLMP Evaluation Report (Admin. Doc. 139, Alaska Region).

Appendix B

The Modeling and Analysis Process

Table of Contents

Planning Situation

The National Forest Management Act of 1976 (NFMA) directs each National Forest to prepare a comprehensive land and resource management plan. The Tongass National Forest produced its first comprehensive Plan in April 1979. The NFMA also directs that these management plans be revised at least every fifteen years. The Tongass began the Revision process in 1987, published a Draft Environmental Impact Statement (DEIS) in June 1990, and prepared the Supplement to the DEIS (SDEIS) as a result of the November 1990 Tongass Timber Reform Act (TTRA). The SDEIS was published in August 1991. This is a revision to the Supplement, called the Revised Supplement to the DEIS (RSDEIS) for the Tongass National Forest.

The Forest's major planning goal under NFMA is to provide decision makers with sufficient information to determine the mix of goods, services, and land allocations that best resolves the identified public issues in a manner that maximizes net public benefits. Net public benefits are defined as the overall long-term value to the Nation of all outputs and positive effects (benefits), less all associated inputs and negative effects (costs), whether they can be quantitatively valued or not.

The 1982 NFMA implementing regulations (36 CFR 219) provide the current direction for an analytical framework for developing forest plans. NFMA and its implementing regulations also provide that the requirements of the National Environmental Policy Act (NEPA) and its implementing regulations (40 CFR 1500-1508) are applicable to this analysis process. NEPA regulations provide for disclosure of significant environmental effects of a proposed action and alternatives to that proposed action.

The purpose of this appendix is to present a technical discussion of the analysis process and models used in the Revision planning process. Due to the magnitude (17 million acres) and complexity (25 land use designations proposed) of the planning process, a number of analytical models are used. This discussion includes basic assumptions, modeling components and inputs, rules, methods, and constraints. The information supplements the broader, less technical descriptions included in the body of Chapter 2 and 3 of the EIS. Additional information and documents used in the analysis process are contained in the planning record. The planning record in its entirety is incorporated here by reference.

Changes Between 1991 SDEIS and the Revised Supplement

As a result of TTRA, updated resource information, and public comment, there were many changes to the SDEIS. Changes from the SDEIS to the RSDEIS are not as dramatic. Most of the changes are improvements to the Geographic Information System (GIS) electronic inventory, improvements in analytic techniques, and modeling design . Consideration of public comment received to date has led to measurable changes in the estimated benefits, costs, and level of goods and services, associated with the land use designations of each alternative

Inventory and Data

There are two general categories of data used in Tongass planning; spatial and tabular. A spatial data base is, for all practical purposes, a map or electronic representation of a map (often referred to as a GIS "coverage"). Tabular data is something like economic information or timber growth and yield tables. These attributes cannot be mapped unless linked to some spatially-known feature from a GIS coverage. The primary changes and updates to the inventory, data, and modeling include:

- Timber harvest map was updated to reflect timber harvested between October 1990 and June 1995.
- A new coverage was created to better estimate timber volumes. This cover was statistically derived using the timber type and common land unit (CLU) covers. For modeling and yield estimation purposes the old-growth strata is now broken into three rather than four groups.
- Inventoried roadless boundaries were changed to reflect new road construction and timber harvest that occurred between October 1990 and June 1995.
- New roads were added to the roads data base.
- Lands conveyed to the State and Native Corporations as of August 1995 were updated in the data base.
- Improvements and updates have been made to most other resource databases, including tentatively suitable lands, logging operability, recreation places, visuals, and hunting data.

Modeling Changes

- Analysis Area stratification (revised)
- Identification and incorporation of State and Native Encumbrances
- Further break-down and analysis of timber age-class groupings
- Updated dispersion coefficients
- Re-calculation of all timber values
- Re-calculation of all cost information
- Use of price trends on timber values (pond log)
- Creation of new management intensity regimes

Inventory Data and Information Collection

Overview. The inventory step of the planning process consists of the collection, development, and documentation of data needed to address the public issues, management concerns and resource opportunities, and planning criteria identified in Planning steps 1 and 2. Two basic types of information are needed to facilitate the analysis and development of alternatives. The first consists of information related to the classification of land into categories with unique properties. This classification can be based on any attribute significant to planning issues. This type of information is tied directly to the map base. In the case of the Tongass National Forest, this map base is its GIS data base.

The second type of information is not directly tied to a map base, but has more to do with the estimation of how land will respond to certain management activities. This type of information comes from many sources: Regional procedural handbooks, research studies, graduate research studies, etc. The most up-to-date and verifiable information available was used for the RSDEIS.

Database Development. Starting in 1987, a computerized GIS was developed for the Tongass National Forest Plan Revision. A GIS links natural resource data with spatial (mapped) information. This linkage enables valuable spatial analysis and rapid display of resource information for forest planning.

Automating the resource information for the Tongass' 17 million acres has taken several years. The data base is among the largest natural resource GIS data bases in the United States. To capture the information for rapid retrieval in tabular form, data is stored in 893,988 points. Spatially, each point represents about 20 acres. Most inventories are updated annually to reflect current conditions; verification of existing information is an ongoing effort One aspect of the Tongass data base is the computer platforms on which the data resides and where the majority of the analyses takes place. The TLMP team as well as each of the three administrative areas has workstation hardware and the latest versions of Arc/Info and Oracle software (these programs are widely used for map making and data queries). This new system has enabled planners to develop better maps (i.e., depicting information in an easier to read form) and conduct more sophisticated analysis faster.

Major Uses of Inventory Data

Analysis Areas. The basic resource information and boundaries contained in the data layers of the mapping system are used to define the areas which are analyzed in the planning process. Analysis areas represent the aggregation of many individual resource polygons that have the same characteristics and similar responses to management activities. A linear programming model (FORPLAN) is then used to assign management prescriptions and schedule activities to these analysis areas (AAs). The analysis area formulation process is described, in detail, in the Forest Planning Model section of this appendix.

Production coefficients. Inventory data were combined with analytical models to develop production values (outputs) expected from various land units. For example, Tongass inventory data is used by a growth and yield simulator to estimate the growth and yield values (coefficients) for use in predictive models (e.g., FORPLAN).

Alternative Development and Analysis. Public issues, resource opportunities, and management concerns were the major elements used to re-assess the management situation and to identify what might need to change in the current plan. The need to change assessment led to formulations of alternative themes to respond to the analysis of the management situation. "Decision trees" (in the planning record) were developed such that the GIS could identify what land use designations would be best suited for specific areas on the Tongass in a way that would be most responsive to the theme of each alternative. Themes were generated to respond to the identified public issues. Except for Alternative 9, the Current Forest Plan and "No Action" alternative, Land use designations for each alternative were assigned based on the "decision trees." The Preferred Alternative for the DEIS and the SDEIS was a mix of the alternatives that maximize net public benefits. The use of inventory data allows accurate reflection of the land base and provides the basis for scheduling activities and outputs. The forest's data base was used to identify those areas in need of special consideration (e.g., high-hazard soils) as alternatives were being developed. This process is discussed further in the Formulation of Alternatives section of this appendix.

Implementation and Monitoring. Inventory data will continue to be essential when the Final Forest Revised Plan is completed and moves into the implementation phase. The inventory will aid in the implementation of site specific projects identified in the forest-wide plan. Also, the inventory will continue to be updated as new information is obtained through monitoring. Data obtained from the evaluation of site-specific activities will be incorporated into the data base for future estimates and planning analysis. Changes in the data and analysis procedures and results and findings from monitoring will be reported annually.

Geographical Information System Data Layers. Many different physical, biological, and administrative layers of resource related information are contained in polygonal form in the GIS (4 gigabytes). These layers formed the basis for the resource data used for programmatic analysis. Some of the commonly used GIS coverages are:

1) Cultural Sites
2) Aspect
3) Slope
4) Elevation
5) Soils
6) Each Long Term Contract Sale Boundary
7) Existing Eagle Nests buffered 330 feet
8) The 141 Management Areas as modified by TTRA
9) Lakes
10) Land Status
11) Minerals (known and inferred)
12) Primary Base Series Shoreline
13) Each of the 228 USGS Quadrangles
14) Existing Recreation Places
15) Existing Recreation Sites
16) Roadless Areas
17) Existing Roads
18) Potential arterial road and transmission corridors
19) Cliffs
20) Special Uses
21) Streams by process group and stream class
22) Subsistence Ever Hunted Deer
23) Timber type map
24) Administrative sites
25) Structures
26) Tour ship and ferry routes
27) Trails
28) 894 Value Comparison Units (VCUs)
29) Visual Resource inventory (VAC, distance zone)
30) Forest watersheds
31) Wildlife Habitat
32) Research Natural Areas
33) Special Interest Areas
34) Estuaries
35) Riparian
36) Managed Timber Stands
37) Tentatively Suitable Forest Lands
38) Eligible Wild, Scenic, and Recreation Rivers
39) Wildlife Analysis Areas
40) Forest Habitat Integrity Program (FHIP) watersheds
41) Cave and Karst Vulnerability
42) Biogeographical Provinces

For a detailed description of the attributes available on these data layers, consult the Resources Information Management Data Dictionary, USFS, Region 10, August, 1995.

Coefficient Development and Estimation of Effects. The GIS enables identification and stratification of land into logical groupings. The response of these groups to management activities was determined from a wide variety of existing data. All coefficients and assumptions made in the modeling process have been developed from the following information sources.

1) Codes and definitions for many of the activities, outputs, and effects come directly from the National Activity Structure Handbook (FSH 1309.16).

2) Timber values were determined using timber appraisal summaries for Southeast Alaska. The timber values where calculated using the quarterly Cut and Sold Reports for the Tongass, 1979-91.

3) The costs relating to timber harvest have been calculated using actual cost expenditure reports.

4) Old Growth timber yields are based on the timber type map, standing volume re-inventory, and the common land unit (CLU) inventory coverage.

5) Yields for regenerated second growth timber stands were derived from permanent study plots and the SEAPROG yield table generation program.

6) Average percent utility volume and defect by Administrative Area was determined from the Timber Sale Statement of Accounts reports.

7) Recreation values where calculated based in part on a Travel Cost study conducted by Data Decisions Group, Inc. and the Southeast Alaska Marketing Council, 1988.

8) The costs of providing and maintaining recreation opportunities on the Forest have been calculated using actual Forest Service cost information. Depending on the activity, costs from as far back as 1979 were used to determine average cost figures.

9) Recreation capacity figures were estimated by each administrative area using the procedures outlined in the Recreation Opportunity Spectrum Users Guide (ROS) (Forest Service Handbook (FSH) 2309.13).

10) Recreation use information and future human population estimates were used to calculate future recreation demand by ROS.

11) Alaska Department of Labor and the Forest Service IMPLAN Model were used to estimate future regional employment and income by resource.

12) Road construction and reconstruction costs are base on a three-year average (1984-87) of total road expenditures. Expenditures were re-calculated for 1991 and 1995.

13) Road densities are based on harvest-transportation paper plans for each TLMP Management Area (MA) that has tentatively suitable forest lands.

14) The cost of construction and reconstruction of Log Transfer Facilities is based on individual facility estimates and location.

15) Fish production models were used to estimate Forest-wide fish production. Production from fish enhancement projects is based on historic production data of similar projects.

16) Value of the commercial fish resource is based on ADF&G's Alaska Catch and Commercial Production Fisheries Statistics Leaflets (Nos. 29-38).

17) Benefits derived from wildlife are based on a study entitled Economic Value of Big Game Hunting in Southeast Alaska. Swanson, et al.

18) Implementation factors used within FORPLAN were obtained through field testing and GIS models.

19) RPA values were used except where Alaska-based study results existed for a particular resource or activity.

The Forest Planning Model (FORPLAN)

FORPLAN is the primary modeling tool used to ensure that land allocations and output schedules for alternatives are realistic and meet standards and guidelines in a cost-efficient manner. FORPLAN is also used to conduct "benchmark" analysis of forest outputs. A benchmark is a set of values that indicate a maximum (or minimum) level of production capable under certain, often limited, constraints. Benchmark reports are available in the Analysis of the Management Situation (AMS). In addition to being used to formulate alternatives and benchmarks, FORPLAN is used to perform detailed accounting and generate summary reports of information needed to construct the display tables in the RSDEIS.

FORPLAN is used to translate forest land, yield, and constraint information into a linear programming matrix. This matrix is read into a program designed to solve and optimize series of simultaneous mathematical equations. Some popular computer software to solve these matrices are LINDO and C-WHIZ. The Tongass uses C-WHIZ on a microcomputer for solving large matrices. The solution obtained from the optimization program is then read back into FORPLAN for interpretation and user-specified reporting.

Results from the modeling process are only approximations of what to expect when any given alternative is implemented. The objective of modeling is to aid planners in estimating likely future consequences of management actions (alternatives). A choice between alternatives can be made even though the model may lack precision in describing specific attributes of a given alternative. FORPLAN, very simply, does two things: 1) creates a linear programming (LP) matrix, and 2) puts the results of the matrix solution into a more readable form (i.e, interprets the linear programming results). FORPLAN enables planners to create an incredibly complex linear matrix through fairly simplistic data entries.

The Land Management Planning and Systems Analysis section of the US Forest Service (based in Fort Collins, Colorado) has developed the next generation of FORPLAN-type analysis tools. This new program is called SPECTRUM and is currently undergoing field tests. Although the Tongass has tested the beta-release of this program and Tongass models are currently being used to evaluate its robustness, we have used FORPLAN for the RSDEIS. Once SPECTRUM has been fully tested, and result-mapping features have been added, the Tongass will begin utilizing SPECTRUM for all long-term scheduling analysis.

A in-depth technical discussion of linear programming can be found in the 1991 SDEIS.

The Tongass FORPLAN models. The FORPLAN program has many internal limitations and parameters. These limitations must be adhered to when developing a model. For instance, the maximum number of constraints any one model can have is about 6,000 (this varies depending on constraint type). Initial size estimates of the Tongass model, given the desired level of detail, made it clear that three models would need to be developed; one model for each of the three Administrative Areas. The individual FORPLAN models were then constructed using information designed specifically for each Administrative Area.

Once the models were formulated, a number of tests were made to check for reasonableness and to make calibrations to matrix coefficients. By altering the objective function and constraint set, the models were able to estimate the resulting costs, benefits, outputs, activities, and land allocations for the particular theme or goal of an alternative or benchmark. A detailed description of model analysis can be found in this appendix under the Effects of Discretionary Constraints and Sensitivity Analysis sections.

Management activities modeled in FORPLAN were determined by the interdisciplinary team (ID team). This pre-FORPLAN analysis included identifying:

1. The activities and outputs.

2. The kinds of land to which each activity could be applied and the response.

3. The rules to which the activities must adhere.

4. The costs and revenues resulting from the application of each activity to a specific type of land.

This method provided the basis for a matrix of all possible management activities that could be modeled and their associated costs, outputs, and benefits.

Developing the FORPLAN Model

Capability Areas. Capability areas are the smallest units of land (or water) for which data are collected in forest planning. They are discrete and recognizable units classified primarily according to physical (soil), biological (vegetation), and issue (wilderness status) factors. All land within a capability area is assumed to be homogeneous in its ability to produce resource outputs and in its production limitations.

The Tongass National Forest has 893,979 capability areas. Each capability area represents approximately 20 acres. A dot grid was developed by placing a point in the center of each 20 acre cell. The resource specialists then decided what information was needed for each capability area in order to assess resource opportunities and public issues. This information was collected and entered into the GIS. The point grid was then overlaid with the map information contained in the GIS. The map information under each point was then assigned as an attribute of the point. The map information from more than 50 different physical, biological, or administrative overlays was assigned to each point. An additional 60 attributes are added to each point as derived coverages (i.e., covers derived from processes involving multiple coverages and models). These attributes, as determined for each capability area, are stored in computer files to form the TLMP Revision data base. The Tongass uses the ORACLE Database Management system in conjunction with the ARC/INFO Geographic Information System (GIS). Once entered into the system, information on capability areas was retrieved, sorted, aggregated, and analyzed.

Stratification of the Land Base. A FORPLAN model has four main components: 1) the land base, 2) management prescriptions, 3) activities and outputs, and 4) constraints. The last three elements greatly influence how the first (the land base) will be defined. The Tongass models are designed to analyze the activities and outputs associated with timber harvest scheduling; therefore the land base is defined only by those characteristics significant to the timber resource. Other resources are dealt with through the LUD allocation process and model constraints. Selecting these characteristics begins by scrutinizing what is known and what is wanted. The management prescriptions applied to the forest differ mostly by rotation age and dispersion amount. The activities (costs) associated with timber harvesting are well documented as are the outputs (benefits) obtained from the wood fiber. The constraints differ by alternative but often refer to a particular timber classification, specific geographic area, activity or output volumes, and management allocation.

Identification of Analysis Areas. The 893,979 capability areas, could not be used as such in FORPLAN. Use of such a large number of land units would be cumbersome, expensive, and greatly exceed the parameters in FORPLAN and the optimization software. Analysis areas were created to handle this problem. An analysis area is a operational aggregation of capability areas that responds in a uniform way to a management prescription.

Choosing Analysis Area Identifiers. Many forest attributes were analyzed for incorporation into the FORPLAN models. A series of statistical and iterative procedures were used to determine which of these attributes had the most significant contribution to the desired level of output detail. Of the 12 attributes tested, five were finally selected for input into the FORPLAN models. These five attributes are: 1) Value Comparison Units, 2) logging operability, 3) Productivity group, 4) roaded/unroaded classification, and 5) timber strata/volume class. A summary of each attribute and why it was selected follows.

Value Comparison Unit (VCU) - In the current Plan, there are 894 unique VCUs. Each of the VCUs provide FORPLAN with a level of spatiality the other identifiers cannot. In previous FORPLAN models, the main spatial identifier was Management Area (MA). Moving to VCU as the spatial identifier increased the resolution of mapping by six times. This change was driven by the desire to improve the modeling of scenery and to provide TLMP team with higher resolution outputs. In the 1979 Tongass Plan there were 867 VCUs delineated on the Forest. The passage of TTRA and several land acquisitions resulted in some VCUs being split and/or added.

There are unique cost and constraint values attributed to each VCU and VCU aggregates. These include all dispersion and timber harvest constraints (see Formulation of Alternatives), log hauling cost, construction of log transfer facilities. road construction needs, and timber sale information.

Timber Harvest Operability - Operability defines the type of timber harvest methods necessary to move trees from stump to landing. There are three different classes of operability, normal (tractor and highlead cable), difficult (long span skyline), and isolated (helicopter). Harvest method is a very important factor when determining the profitability of timber harvest. Lands identified as difficult and isolated are rarely economically viable. Operability also correlates quite strongly with elevation and general accessibility.

Productivity Groups - This land classification is base on the site productivity as categorized in the Soil Mapping Unit (SMU) data base. There are three basic groups: 1, 2, and 3. The group indicates the regeneration potential for future timber stands. Group 1 is the highest productivity class with a minimum site index (SI) of 75. Group 2 are lands less than SI of 75. Group 3 is all lands in the following wetland soil types; Karheen, Kaikli, Maybeso, Kitkum, or lithic Cryosaprist. Group 3 has a SI of 40 (Chatham) to 50 (Ketchikan).

Roaded Classification - This identifier specifies whether an area is presently roaded or unroaded. The road/roadless condition of an area greatly influences the cost of harvesting the timber. Unroaded areas require road construction while those presently roaded require only road maintenance or road reconstruction. This identifier also enables better tracking of certain recreational opportunities and wildlife habitat.

Volume Class/Strata - This attribute is a significant attribute for all forest activities and outputs. Wildlife habitat and most recreational settings correlate with the vegetation type. As vegetative cover changes (through growth and harvest) so do most of the activities and outputs associated with that area. There are four strata used as FORPLAN identifier: second growth stands (average age 22 years), low-volume oldgrowth, medium-volume oldgrowth, and high-volume oldgrowth. The strata used for this identifier are obtained from a coverage derived from the timtype and common land unit (CLU) coverages. This creation of this cover was in response to the problems occurring when using the timtype alone to estimate volume. This new cover is statistically more accurate (although less precise) in growth and volume information.

With the selection of five level identifiers, the next step was to estimate the number of possible analysis area combinations. The maximum number possible is the product of the number of levels in each identifier:

894 VCUs x 3 Operability Classes x 2 road/unroaded x 3 productivity groups x 4 strata =

64,368 Potential Analysis Areas

Of course, all combinations are unlikely to occur so the actual number should be less than this estimate.

Modeling of Tentatively Suitable Forest Lands Only. It should be noted that the FORPLAN models for the Tongass will only analyze land classified as tentatively suitable for timber harvest. This means only those lands considered "suitable" for timber harvest will be entered into the models. Of the approximate 17 million acres of Tongass only 2.3 million are classified as tentatively suitable. In the 1991 SDEIS, there were approximately 2.5 million tentatively suitable acres on the Tongass. The reduction is due to many factors but primarily to the addition of Class I and II streams (hence, more TTRA buffers), transfer of land, and on-the-ground identification of lands not suitable for timber management. The process for determining suitability can be found in Appendix A, "Timber Suitability Classification," of the Revised Forest Plan.

Actual Total Analysis Areas. Once the identifiers were determined, the GIS data base was queried to calculate the actual number of unique analysis areas. This resulted in a total of 8,455 unique analysis areas Forest-wide. Summary of these analysis areas showed almost one third being less than 50 acres in size. Because of rounding and other mathematical necessities within the FORPLAN matrix, small values tend to "get lost," especially when very large values are in the same model. For this reason, all analysis areas less than 100 acres and within certain guidelines were aggregated into a larger analysis area. This meant that an identifier of the small analysis areas would have to be altered.

Aggregation of Analysis Areas. Analysis showed that the roaded/unroaded identifier had the least overall impact (i.e., minor contribution to uniqueness) and was responsible for the majority of small analysis areas (less than 25 acres).

The aggregation process: the small analysis areas were aggregated into the one that matched when roaded condition identifier was ignored. If a match could not be found at that point then operability was ignored and a match found based on VCU, volume class. If still no match could be found then the last identifier to be aggregated was Volume class. The need to aggregate over volume class occurred infrequently and only when a VCU had very few acres of tentatively suitable forest lands. The VCU indentifier was never aggregated because of the spatial benefits provided by this identifier and the importance of this attribute to constraining and reporting. Further work and analysis with the analysis areas quickly revealed that Productivity Group could be represented by grouping analysis areas. Since this reduced the number of possible analysis areas by a factor of three it significantly lessened the size of the models. The final FORPLAN level identifiers are shown in Table B.01.

Table B.01
FORPLAN Level Identifiers

Identifier	Possible Attributes
Value Comparison Unit Unit (VCU)	00 through 3950 (Chatham)
	5270 through 8670 (ketchikan)
	3980 through 5260 (Stikine)
Logging Operability	Tractor/Standard Highlead Cable
	Skyline/Suspension
	Isolated Stand (Helicopter)
Roaded Condition	Roaded
	Unroaded
Volume Class/Strata	Second Growth Stands
	Low Volume Oldgrowth
	Medium Volume Oldgrowth
	High Volume Oldgrowth

Management Prescriptions

A prescription is a group of management practices applied to a specific land area. The planning process concerns the allocation of land to various prescriptions. The range of prescriptions describes the possible activities for a given analysis area. FORPLAN allocates land to prescriptions based on forest constraints and the given management alternative.

Prescriptions were developed by the ID team to represent the full range of possible management activities and outputs. The interdisciplinary team quantified the outputs, costs, and benefits that would occur when a prescription was applied to a given analysis area or land unit. This quantification process produced the output, cost, and benefit coefficients that are used in FORPLAN yield and economic tables. The ID team, during its development of standards and guidelines for all prescriptions, ensured that the specific management requirements set forth in 36 CFR 219.27 would be met in accomplishing the goals and objectives for the Tongass.

FORPLAN prescriptions were developed to allow consideration of a full range of management activities on the analysis areas. A minimum level prescription was created for each analysis area to allow a choice between selecting the possible intensive practices or selecting no active management practice. Limiting the number of available prescriptions is a constraint. The only criterion used to eliminate timber options concerned technical feasibility. For example, tractor logging was not considered on slopes greater than 60 percent. Other than this criterion of technical feasibility, all timber options were included in the model. The development of timber options was not limited by economic efficiency. Available timber options were not eliminated from consideration because they produced a negative Present Net Value (PNV) or even a lesser PNV than some other timber option. A full range of timber options with varying levels of economic efficiency was available to the model. The FORPLAN prescriptions analyzed are briefly described below. Additional information about these prescriptions and the prescription development process is included in the FEIS Chapter 2 and in the planning records.

FORPLAN Prescriptions Unique to Analysis Areas.

Minimum Level/Maintenance. - Applies minimum custodial direction for all resources to all analysis areas. There are no associated developed recreation, timber, or watershed treatment outputs. In essence, this is the prescription FORPLAN would have assigned to unsuitable lands if they were included in the model.

Clearcut without precommercial thinning. - Removal of all merchantable commercial trees within a stand in one operation. The regenerated stand receives no subsequent precommercial thinning.

Clearcut with precommercial thinning. - Removal of all merchantable commercial trees within a stand in one operation. The regenerated stand receives a subsequent precommercial thin at 15 to 20 years of age.

Small group selection and uneven-aged harvesting. - Cutting trees with the objective of producing uneven-aged stands with regeneration of desirable species. Trees are harvested individually or in small groups normally from 0.5 to 5 acres in size. Primary emphasis in these areas is other than timber production (recreation, scenery, fisheries, and wildlife, for example).

Log Transfer Facility (LTF) construction. - The construction or reconstruction of LTF's designed to permit transfer of harvested logs into saltwater for tow or barge to a mill site.

FORPLAN Constraints

There are two categories of constraints within a FORPLAN linear matrix: implicit and explicit. Implicit constraints are common to all FORPLAN models. For example, the acres allocated to a particular prescription can never exceed the total number of acres in the model. Likewise, all acres in a model must be allocated to something. These equality constraints exist in every FORPLAN model and are underlying assumptions of linear programming.

Explicit constraints are those constraints added to FORPLAN models by planners. These constraints come in many forms and are applied to mimic the regulations and laws governing NFMA guidelines set forth in the forest plan, and on-the-ground operating conditions. An example is the non-declining yield constraint. A constant flow (non-declining yield) of timber volume is Forest Service policy. A constraint is added to the FORPLAN data set that forces all timber harvest volumes to be at least as great as the previous decade's harvest volume. Another example may be a constraint that forces a certain area to be managed specifically for wildlife habitat. There are many explicit constraints in the Tongass models. They vary by Administrative Area and by management alternative. The explicit constraints used in the FORPLAN models fall into two categories: Timber policy constraints and operational constraints. A detailed discussion of the content of these constraints follows.

Timber policy constraints. These constraints are included in the FORPLAN models to represent legal or policy requirements of National Forest timber management. The primary requirements regarding timber management incorporated into Tongass FORPLAN models are:

Sustained Yield/Non-declining Flow. The Tongass models have a constraint that ensures harvest flow (in cubic feet) will not decline at any time over the 160-year planning horizon per national policy. Yields may increase but all subsequent harvests must be at least as much as the previous year's harvest.

Culmination of Mean Annual Increment. The age at which a tree is harvested is called the rotation age. Agency policy is that rotation age can be no earlier than 95% of culmination of mean annual increment (CMAI). CMAI is the point in a stand's age when periodic growth (10-year growth) starts to decline. It also corresponds to the point in time when the stand's volume is still increasing but at a decreasing rate. The FORPLAN models have constraints that allow timber harvest only when a stand has reached 95% CMAI. This translates to a range of rotation ages of about 60 to 170 years. CMAI varies by stand productivity and management prescription and is calculated using merchantible cubic foot volume.

Dispersion of Harvest Units. To meet adopted visual quality objectives and cumulate watershed objectives, dispersion constraints are incorporated into the models to ensure that FORPLAN "meters out" timber harvest over an analysis area. The dispersion limits are taken from proxies developed by Tongass landscape architects. These visual guidelines estimate how much of a viewshed can be "disturbed" at any one time and still meet the adopted visual quality objectives of the area. They also specify length of time before harvest of adjacent units and the maximum size of these units. Modeling these guidelines necessitated the development of what are known as Regulation Classes in the FORPLAN models. This process is described below.

Operational Constraints. These constraints are added to FORPLAN models to ensure that the results fall within certain guidelines and objectives. These may not be legal requirements nor regional guidelines but entered to make sure the model is “well-behaved.” The term well-behaved means that FORPLAN results are reviewed for any operationally impossible solutions and constraints are added to deal with these. An example may be the harvest of a 20-acre unit 30 miles from any existing road. The operational constraints used in the Tongass FORPLAN models vary slightly by alternative but are used primarily to control the spatial and volume components of timber management. These constraints are:

Strata Harvest Control Constraints. In order that the harvest schedule is composed of a mix of volume strata, each model is constrained so that the proportion of the highest volume strata does not exceed the total forest-wide proportion of that strata. The coefficient is adjusted to account for the type of land (volume class mix) available in each alternative. The average, the constraint limits the total harvest acreage (per decade) to be composed of less than or equal to 47 percent.

Logging Operability Constraints. The forest has three classes of logging operability; normal, difficult, and isolated. In order to ensure that all harvest does not come from the most economic normal operability areas, constraints were added to disperse harvest to the other classes. These percentages are based on historic averages of operability class timber harvest and occurrence. This constraint limits harvest from normal operability areas to, at most, 77 percent of total harvest acreage per decade.

Precommercial Thinning Constraint. All alternatives are limited to a maximum precommercial thinning of 6300 acres per year. This is the amount that Region 10 considers feasible given budget and personnel limitations

Roading Construction Constraint. Historically, for every two million board feet of timber harvested, a mile of road was constructed. During the optimization phase cf a FORPLAN run, the same level of harvest can often be achieved with slightly fewer miles of road construction. This is discussed in the Results section of this appendix but has to do with the fact that VCU road coefficients deal only with roads within the VCU group boundaries. Because of this, constraints have been added to all alternatives to match historic road miles per volume harvested ratios. Over time, fewer roads are needed to access the same amount of timberland due to the establishment of the road network. For the first decade of all alternatives the constraint forces at least one mile of road construction for every two million board feet of timber harvested. Decade two requires at least one mile for every three million board feet harvested. The need for new road construction decreases as the road network is developed. Near the end of the planning horizon (150 years from now), the road network is finally in place and road reconstruction (and maintenance) is the only activity.

Factors Affecting the Allowable Sale Quantity (ASQ). An ASQ is calculated using Forest, Area, and VCU-wide information. The level of accuracy and spatial specificity of these inputs to the ASQ vary based on the amount of information available and experience in field measurement. The inputs to ASQ are often estimates and averages of what is anticipated to be encountered during Plan implementation. Given the variability in these field estimates and the knowledge that reductions to estimated sale quantities are often encountered on-the-ground due to unforeseen land characteristics, factors have been established to adjust the ASQ estimates to a level more in tune with what is likely to be found during implementation. These factors are referred to as Modeled implementation Reduction Factors, or MIRFs. These factors are included in each model for each alternative. They are applied in order to address the reductions in lands available for timber harvest due to:

- Land selections
- karst/caves (moderate vulnerability)
- Unmapped Class III stream buffers
- Deer Standards and Guides
- New Bald Eagle/Osprey Nests
- 600 foot landscape linkages
- Goshawk nests
- Non-enacted municipal watersheds
- Murrelet nests (600 feet)
- 600 foot buffer around active wolf dens
- Important mountain goat winter habitat and travel corridors
- Cost efficiency (low vol, difficult operability, isolated operability)

There are other factors that may also contribute to differences between ASQ and actual timber sale volume that are not included in the MIRF development. Some of these are Forest Service budgets, timber planner preferences, and legal challenges.

In order to calculated the MIRFs for each alternative, FORPLAN outputs and on-the-ground sale layout plans were compared. This process identified the key factors resulting in ASQ and implementation differences and the extent of each. The table below shows the acreage reductions due to the factors listed above. These are then interpreted into constraints for use in FORPLAN.

Table B.01a
Acreage Reduction by MIRF Element

Model Implementation Reduction Factors	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Land Selections		24	18	24	22	22	32	21	29
Suitability Classification-									
TTRA Stream Buffers		28	21	27	25	25	37	24	33
Non-Comm. Forest		25	19	24	22	22	32	21	30
Slope/Soil Hazards		35	26	34	31	31	45	30	41
Cost Efficiency	73	96	72	93	88	88	154	103	125
Standards and Guides									
Riparian Habitat			74	11	10	10		10	
Karst/Caves - Moderate Vulnerability		33	25	32	30	30	44	29	40
Deer Habitat S & G's			21	54	34	34			
Miscellaneous S & G's		11	8	11	10	10	15	10	13
Total Model Implementation Reduction	73*	253*	283*	310*	270*	207*	359*	246*	312*

* Totals may be off due to rounding.

The MIRF acres are then subtracted from total suitable acres by using constraints within the FORPLAN models. The impact to the land base due to these factors for each alternative is shown, in acres, in Table B.02.

Table B.02
Acreage Removed to Account for Implementation Reductions (MIRFs)

Alternative	Suitable Acres (thousands of acres)	Acres Removed (thousands of acres)	Suitable Acres Remaining for Timber Harvest
1	73	73	0
2	1,533	253	1,280
3	1,194	283	911
4	1,512	310	1,202
5	1,405	270	1,135
6	1,405	270	1,135
7	2,050	359	1,691
8	1,395	246	1,149
9	1,874	312	1,562

The Regulation Class Process

One major change between SDEIS and the Revised Supplement is the creation and incorporation of four regulation classes (instead of three). In order to effectively model the timber resource, four regulation classes were developed. These classes group lands that allow similar clearcut size, visual disturbance, and re-entry times (adjacency) Every Land Use Designation, or LUD (map color), specifies a particular set of standards and guidelines that apply to that area. For instance, in the Timber Production LUD (TM) harvest intensity varies by the inventoried Visual Absorption Capability (VAC). The VAC is a measure of an area's ability to "absorb" ground disturbing activities (i.e., timber harvesting). The amount of timber harvesting is also affected by Distance Zone (DZ). Distance Zone is the proximity of an area to a view-point. Distance zone varies from Foreground (within a 1/4 mile) to Not-Seen which is completely out-of-view from selected viewing points.

Tongass landscape architects developed some general timber harvesting guidelines, or proxies, for various VAC and VQO settings and Land Use Designation (LUD). Although the exact harvest intensity an area receives is determined during the timber sale layout stages, estimates of allowable disturbance were needed in order to facilitate FORPLAN modeling. Each Land Use Designation has a series of adopted VQO and VAC objectives. Associated with these objectives are the estimated allowable disturbance factors. The proxies for each LUD and VQO/VAC setting were grouped by similar harvest method and unit size, cumulative visual disturbance, and height to adjacent stand. Grouping the proxies of similar standards resulted in the creation of three distinct categories. These three groups became the four regulation classes used in the FORPLAN modeling. The fourth regulation class is no-harvest. Information concerning the figures used to create regulation classes, as well as the rationale behind the values, can be found in the planning records and in the SDEIS. The GIS is then used to provide FORPLAN with the regulation class allocations by alternative for each Analysis Area. The following tables summarize the approximate harvest intensity and disturbance factors by LUD, VQO, distance zone, and VAC.

Table B.03
VQO from Scenery Standard and Guideline

LUD	Foreground	Middle Ground	Background	Not Seen
Scenic Viewshed	Retention	Partial Retention	Partial Retention	Max Modification
Modified Landscape	Partial Retention	Modification	Modification	Max Modification
Timber Production	Modification	Max Modification	Max Modification	Max Modification

Table B.04
Maximum Unit Size based on Visual Absorption Capability (acres)

VQO	Low VAC	Interm. VAC	High VAC
Retention	< 2	5-15	15-30
Partial Retention	5-10	15-40	40-60
Modification	15-40	40-60	80-100
Max Modification	50-75	80-100	80-100

Table B.05
Percent Allowable Visual Disturbance

Land Use Designation	Distance Zone	VQO	Low VAC	Interm VAC	High VAC
Scenic Viewshed	Foreground	R	8	10	10
	Mid. Ground	PR	8	15	20
	Background	PR	20	20	20
	Not Seen	MM	20	20	20
Modified Landscape	Foreground	PR	8	15	20
	Mid. Ground	M	15	20	25
	Background	M	25	25	25
	Not Seen	MM	25	25	25
Timber Production	Foreground	M	15	20	25
	Mid. Ground	MM	50	50	50
	Background	MM	50	50	50
	Not Seen	MM	50	50	50

The above percentages are rough estimates intended to depict the possible level of disturbance one may encounter when viewing these areas. For modeling purposes, these visual disturbance zones were aggregated into groups with similar standards and economic response (e.g., logging costs). Since the percent of visual disturbance includes as the denominator all visible terrain, tests had to be conducted to "recalculate" disturbance thresholds due to the fact that only suitable lands are being modeled. These tests involve a series of iterative mapping exercises where varying levels disturbance factors were applied to the separate groups. The feasibility of the harvest level was then compared to the standards and guidelines and reviewed by a landscape architect. This work was conducted under the following assumptions;

1) the items in the database (e.g., distance zone, visual absorption capability) are correct,

2) the standards and guidelines are modeled to their limits, and

3) the "viewshed" was a large area (e.g., as viewed from a boat).

This work did indicate a need to further review the scenery components of the database but in general the process worked well in terms of modeling the intent of the standards and guidelines. This work resulted in three distinct regulation classes that permit timber harvest activities. The final allocation of regulation classes to the various disturbance zones is shown in Table B.06.

Table B.06
Regulation Class Allocation

Land Use Designation	Distance Zone	VQO	Low VAC	Interm VAC	High VAC
Scenic Viewshed	Foreground	R	3	3	2
	Mid. Ground	PR	3	2	1
	Background	PR	3	2	1
	Not Seen	MM	2	1	1
Modified Landscape	Foreground	PR	3	2	1
	Mid. Ground	M	2	1	1
	Background	M	2	1	1
	Not Seen	MM	1	1	1
Timber Production	Foreground	M	2	2	1
	Mid. Ground	MM	1	1	1
	Background	MM	1	1	1
	Not Seen	MM	1	1	1

These regulation classes have two distinct roles in modeling; constraining for scenery objectives and harvest cost determination. There are two main components of scenery constraints; the total visual disturbance and adjacency considerations. These constraints are shown in Table B.07.

Table B.07
Generalized Visual Constraints

Regulation Class	Visual Disturbance	Adjacency (green-up)
1	40%	20 Years
2	30%	25 Years
3	20%	60 Years

There are some very important things to remember when viewing the above table:

1) Disturbance percent is based on suitable lands only, not the entire viewshed.
2) These values are entered into the FORPLAN models individually by VCU.
3) The disturbance and adjacency factors for regulation class 3 are based on the use of very small patch cutting. Optimally, disturbance and adjacency would not be an issue with true uneven-aged management (i.e., partial stand removal).

Since Land Use Designation (LUD) is one factor in determining regulation class allocation, the breakdown of each of the nine alternatives into regulation class varies depending on the objectives of the alternative. Table B.08 shows how LUD impacts the determination regulation class. It is important to realize that, in some cases, the objectives of a particular alternative may require allocation of land to a management intensity that is less than what is permitted under the regulation class process. Regulation class 0 is a no-harvest allocation.

Table B.08
Allocation of LUD to Regulation Class by Alternative

Alternative	LUD	RegClass 0	RegClass 1	RegClass 2	RegClass 3
1	TM	8%	0%	0%	92%
2	SV	19%	18%	44%	18%
	ML	21%	63%	2%	14%
	TM	11%	80%	7%	2%
3	SV	22%	16%	37%	26%
	ML	22%	52%	2%	24%
	TM	14%	69%	6%	11%
4	SV	20%	16%	41%	23%
	ML	21%	58%	2%	19%
	TM	11%	76%	6%	6%
5	SV	21%	15%	41%	23%
	ML	21%	58%	2%	19%
	TM	11%	76%	6%	6%
6	SV	21%	15%	41%	23%
	ML	21%	58%	2%	19%
	TM	11%	76%	6%	6%
7	ML	6%	67%	14%	14%
	TM	5%	81%	8%	6%
8	ML	16%	60%	8%	16%
	TM	15%	68%	6%	10%
9	SV	4%	59%	22%	15%
	TM	5%	84%	9%	2%

Incorporation of Regulation Class into GIS and FORPLAN

In order to incorporate the regulation class values into the GIS (and FORPLAN), the components in the above tables used to determine regulation class had to be in the GIS database. The primary data elements of distance zone and visual absorption capability (VAC) exist in the TLMP database. In order to calculate visual quality objectives (VQOs) the land use designation (LUD) must be known. The LUD is obtained from the alternative map (i.e., map color). The corporation of LUD (map color) is done by overlaying the alternative map onto the 900,000 Tongass data points. Now, using LUD and distance zone, the VQOs can be determined (see table B.03). Once VQO is known, the standards and guidelines can be used to determine maximum clearcut size for each VAC rating (see table B.04). Then, using the information from table xx a regulation class allocation is given to every point in the database for each alternative.

The process for assigning the 8.1 million regulation class values is done through the use of computer programs written specifically for the GIS data base system. These programs "ratchet' through the data points and evaluate the conditions responsible for regulation class determination. Once the appropriate regulation class is assigned, the program moves to the next point. Once this process is complete, all the Analysis Areas (AAs) have been tagged with up to four different regulation class assignments.

Incorporation of Unique Alternative Elements into GIS and FORPLAN

The process for creating the first round of regulation class allocations is described above. That process provides regulation classes based solely on LUD, VQO, distance zone, and VAC. Before the AA allocation data is supplied to FORPLAN, additional processing is required. This second step incorporates the unique components of each alternative by recalculation of regulation class. In some cases, these alternative components are addressed via FORPLAN constraints not by the recalculation of regulation class. The constraint limits applied to those are usually derived from the GIS data base. Table B.09 shows the primary unique components found in each alternative. Table B.10 indicates whether the component is modeled with a change in regulation class, a FORPLAN constraint, or both.

Table B.09
Unique Alternative Elements

Element	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
Reserves			all		4	4		all	
VCU Threshold				25%	25%	50%			
OG Retention				33%	33%	33%			
FHIP 1	Opt 2	Opt 3	Opt 1	Opt 2	Opt 2	Opt 2	Opt 3	Opt 2	Opt 3
FHIP 2,3	Opt 3	Opt 3	Opt 2	Opt 3	Opt 3	Opt 3	Opt 3	Opt 3	Opt 3
Beach 500 Harv	no	no	no	no	no	no	yes	no	yes
Beach 1000 Harv[1]	UM	yes	UM	UM	UM	UM	yes	UM	yes
Estuary Harv	no	no	no	no	no	no	yes	no	yes
Deer habitat	yes		yes	yes	yes	yes			

[1] UM indicates Uneven-aged Management

Table B.10
Model Incorporation Method

Element	Method
Reserves	Both
VCU Threshholds	FORPLAN Constraints
OG Retention	FORPLAN Constraints
FHIP 1	GIS Reg Class Change
FHIP 2,3	GIS Reg Class Change
Beach 500 Harvest	GIS Reg Class Change
Beach 1000 Harvest	GIS Reg Class Change
Estuary Harvest	GIS Reg Class Change
Deer habitat	GIS Reg Class Change

In general, any element that could be mapped (spatially explicit) was modeled by re-allocation of regulation class. Elements that dealt with percentages and proportions of the land base and could not be mapped were modeled by FORPLAN constraints.

An in-depth discussion of these elements and their rationale exist in other parts of the document and will not be reiterated here. The discussion in this section will focus on how these components were represented in the data base and modeled in FORPLAN.

Reserves
Four of the nine alternatives have either all or some of the wildlife reserve areas. This element consists of three reserve sizes; small, medium, and large. The medium and large reserves are shown on the alternative maps thus regulation class allocation of zero is given for each in the first process. Due to their size, small reserves are not mapped but the composition of them is very specific in terms of vegetation and spacing (one small reserve in most VCUs). To model the impact of small reserves to the harvest schedule, the acres of suitable land required to meet the reserve specifications were determined through queries. The acres likely to be removed from the suitable base where then forced to a no-harvest prescription in FORPLAN. This was done for each VCU.

VCU Thresholds
Three of the alternatives required that no more than 25% (or 50% for alternative 6) of the productive forest land be composed of regenerated stands in any 50-year period. The threshold concept then allows an additional 25% (or 50%) increase for the next 50-year period. This approach is intended to create a wider distribution of age classes than may be generated under more traditional harvest scheduling process. The threshold limits where determined for each VCU in the appropriate alternatives and acres available for harvest were limited in 50-year intervals.

Old-growth Retention
This series of constraints applied to three alternatives and limited the lands available for harvest to 33% of the remaining productive old-growth acreage. The right-hand side values for these constraints were determined for each VCU using the TLMP data base. This constraint did not impact regulation class allocation but forced a no-harvest intensity.

Riparian Habitat and Watershed Constraints (FHIP)
Definition and delineation of riparian and stream habitats is the most complex and computer intensive operation conducted in the Revision. The sheer number of streams (45,000 miles) combined with a complex array of varying width buffers make this process very complicated. The coverages that result are applied to the main database and used for the secondary re-calculation of regulation class. The secondary regulation class process is essentially a trumping of a more intensive regulation class by a less intensive one.

There are three different riparian prescriptions (options) being proposed. Each one has very specific protection levels (buffers) applied to various classifications of streams, soils, and wetlands. The first step in this process was to develop a coverage for each of the three options. These three coverages were then overlaid onto the approximately 900,000 point database. The attributes contained within each cover (and added to the database) indicated the maximum timber management intensity permitted for that point for each riparian option. This same process was used to provide each point with a FHIP rating (1,2, or 3) using the FHIP watershed polygon coverage. FHIP watersheds refers to those watersheds with known higher value (FHIP 1) or lesser value (FHIP 2 or 3) as determined by a process originally laid out in the current (1979) TLMP.

Now, using the alternative information, FHIP rating, and appropriate riparian option, the regulation class from the first step is compared to the maximum management intensity permitted by riparian option. If the primary allocation allows greater intensity then the regulation class is recalculated. The general rule of the algorithm is that less intense regulation classes trump more intense regulation classes.

500 and 1000-Foot Beach Buffers
Using the buffering algorithms available in Arc Info, 500-foot and 500 to 1000-foot buffers where created and added to the database Depending on the alternative, reallocations were made to the primary regulation classes. Again, the trumping procedure described above was applied here.

Estuary
The Revision database contains a polygon coverage of estuary areas. These where incorporated into the database using the same process as the above elements. The recalculation of regulation class was then conducted depending on the alternative and primary regulation class allocation. Again, the trumping procedure described above was applied here.

Deer Habitat VCUs
Some of the alternatives applied a no-harvest (regulation class 0) prescription to certain VCUs due to high importance as deer wintering habitat and where a certain amount of timber harvest has already occurred. Rather than using a coverage specific to these areas, a look-up table was used to select the necessary VCUs. Once the appropriate VCUs and alternatives were selected, all regulation class values greater than zero where recalculated to zero. The queries, spreadsheets, and field notes that were used for the formulation of FORPLAN constraints and regulation class allocation (as described above) are available in the TLMP planning record.

Now that both steps of the regulation class allocations are complete, the AA information is now ready to move into the FORPLAN models. Using a series of programs, each AA is listed with the number of acres going to each regulation class. This is done for each alternative. The listing obtained from the GIS following regulation class allocation looks like this:

Analysis Area	Regulation Class	Acres
A01	0	1290.
A01	2	880.
A01	3	229.
A02	0	690.
A03	1	1232.
A03	2	120.

The above information is delivered in ASCII format and converted by another program into the Analysis Area format demanded by FORPLAN. FORPLAN utilizes the prescription control feature to allocate the proper percentage of each AA to each regulation class. A look-up table is used to link the AA code (e.g., A01) with the appropriate level identifiers as needed by FORPLAN. The AAs are then grouped into productivity classes within the FORPLAN models. In order to minimize superfluous and redundant FORPLAN constraints, the dispersion constraints are generated based only on the analysis areas and regulation class elements in the model.

Analysis Process Outside of FORPLAN

Recreation, hunting, and fish production were analyzed outside of FORPLAN for two reasons: 1) FORPLAN is unable to properly account for certain elements which drive demand for certain activities (e.g., population change, trends of usage), and 2) previous analysis may have shown little or no impacts from management activities so further analysis with the same data would have been redundant.

Recreation. The habitat capability, demand, and costs of recreation were modeled outside of FORPLAN Recreation areas on the Forest have been delineated and these areas provide the recreation capacity and account for the management costs. Projected demand is equated to use as long as it is less than or equal to the amount of capacity. In the event that capacity is less than anticipated demand, use is assumed to equate to capacity. In estimating future recreation availability on the Tongass, a maximum potential effects analysis was used. Also, some assumptions were made about certain areas and recreational settings once timber harvest activities had occurred.

First, recreation opportunities with similar settings were aggregated as follows:

Group 0 - Identified as not providing recreation opportunities
Group 1 - Primitive and Semi-primitive Nonmotorized
Group 2 - Semi-primitive Motorized
Group 3 - Roaded Natural and Roaded Modified

Next, assumptions were made as to what would happen if timber harvesting took place in the Recreation Group. The assumptions are:

1) Timber harvesting in Group 1 or Group 2 would remove any potential for recreation (becomes Group 0), unless;

2) The area is accessible by ferry or roads, in which case, the area would provide Roaded recreational opportunities (becomes Group 3).

3) If the area is of Group 3, then timber harvesting or any land disturbing activity would have no effect on the area's ability to provide Roaded recreational opportunities (stays Group 3).

Next, through a series of GIS queries, all identified recreation places (see Recreation Place map) allocated to a timber harvest prescription were placed in their recreation group and capacity was recalculated. This allowed planners to analyze not just the capacity of recreation opportunity, but the mix of different types of opportunities. The costs of maintaining and providing recreation opportunities is also analyzed outside the FORPLAN model.

Hunting. See the discussion in the Wildlife Demand section of chapter 3 of the Revised Supplement for a detailed discussion of hunting habitat capability, hunter demand and habitat capability.

Fish. Fish production capacity and the economics of the fisheries resource is modeled outside of FORPLAN. Timber management, done in accordance with TTRA, assures the protection of riparian areas by maintaining at least a 100 foot no commercial harvest buffer along Class I streams and those Class II streams flowing directly into Class I streams. Use of Best Management Practices (BMP), along all streams, provides further assurance of maintaining water quality and stream habitat. In order to consider reduced risk to fish habitat, three levels of riparian protection were developed as discussed above.

Mathematical Models used outside of FORPLAN. Two models, IMPLAN and SEAPROG, are used to generate input data for FORPLAN. An input/output model was built using the IMPLAN system to estimate income and employment effects resulting from changes in Forest outputs and land allocations. Timber volumes for regenerated stands are developed through the SEAPROG growth and yield model. SEAPROG used bare-ground projection components to calculate these yields. Updates to the SEAPROG model were made for the RSDEIS. A more detailed description of each of these models can be found in the 1991 SDEIS.

Economic Efficiency

Net Public Benefits - Net public benefits are the "overall long-term value, to the nation, of all outputs and positive effects (benefits) less all associated Forest inputs and negative effects (costs) whether they can be quantitatively valued or not" (36 CFR 219.3). Net public benefits represents the sum of the net value of priced outputs plus the net value of non-priced outputs. For additional discussion refer to the 1991 SDEIS.

Costs used in the FORPLAN Analysis

All costs used in the FORPLAN analysis are adjusted to base year 1995, first quarter. Cost information was used from as early as 1978 through 1994, depending on the activity. When information for 1994 was unavailable, the National Producer Price Indices were used to convert to the desired time period. In order to reduce the number of numeric tables in this appendix, only average and summarized values will be used in this section. The actual cost figures used in the analyses are available in the planning records.

Log Transfer Facility, Haul, and Roading Coefficients. These costs were calculated for over 100 different VCU aggregates (based on Management Area). Using the Log Transfer Facility map and data base, each LTF, existing or proposed, was assigned to the appropriate VCU. The cost of LTF construction or reconstruction and timber hauling was determined from existing information and engineering estimates. The hauling cost represents the cost to get one MBF of timber from the landing to the mill.

Administration Area	LTF Cost (ave$/acre)	Haul Cost (ave$/mbf)	Road Const. (miles/Macres)
Chatham	21.7	49.3	8.9
Ketchikan	13.6	38.9	8.7
Stikine	14.2	40.3	7.7

Timber Sale Preparation and Administration. This is the cost to the Forest Service of administering and laying out timber sale areas. In developing the costs for FORPLAN, attributes that affect sale preparation costs were identified: roaded vs. unroaded areas, higher costs in regulation class 3 (group selection/single tree selection) versus other regulation classes (clearcut), and higher costs in some operability classes. In general, sale preparation costs range from $48 to $160 per Mbf.

Road Construction. The cost of local, arterial, and collector road construction costs vary due to the management emphasis of an area. Areas with an emphasis on visual quality (natural settings, etc.) will have higher road construction costs. Roads in these areas will require longer transportation of road bed material (due to fewer rock quarries per mile of road construction), increased engineering support costs (strategic placement of road), and road location (often constructed in a place that is less cost efficient). On the Tongass, the cost per mile of road ranges from $256,000 to $512,000.

Road Reconstruction Costs. Roads that have been constructed and only minimally maintained must be reconstructed to get the road up to standards suitable for timber hauling. The cost of reconstruction is determined by the amount of maintenance and time since last reconstruction or construction. Regulation class is used to estimate road reconstruction cost since the estimated time between harvest entries is tied to regulation class and this is a critical element in reconstruction costs calculations. The average cost of road reconstruction is $55,600 per mile.

Road Maintenance. Once roads are constructed there is often a certain amount of annual maintenance. Road maintenance depends on current road use and anticipated future logging activity. Again, road maintenance costs are based on regulation class allocation. Regulation class 1 and 2 roads, due to a greater use, will be maintained for light-use standards (maintenance levels 2 and 3). Average road maintenance cost is $161 per mile per year.

Reforestation Certification. The predominant form of forest regeneration following clearcut harvesting is natural regeneration. Very little planting or seeding is done on the Tongass National Forest. The soils and weather conditions of Southeast Alaska are very conducive to natural regeneration. The Forest Service certifies successful regeneration five years following clearcut harvesting. In the event of unsuccessful regeneration, more aggressive regeneration actions are undertaken. The average cost of certifying that regeneration has occurred has been $13.10 per acre.

Precommercial Thinning. The National Forest has an active program of precommercial thinning. This improves the health of the stand and permits greater understory development for wildlife. This thinning operation is termed "pre-commercial" because no revenues are derived from the sale of the harvested trees. The average cost for precommercial thinning on the Tongass is $500 per acre. This silvicultural activity is conducted when the stand is between ten and 20 years old.

Logging Costs. Logging cost is the amount of money a timber buyer spends to build temporary roads and fell, buck, and skid the trees to the landing. The logging cost calculations were determined using the procedures outlined in the Forest Service Handbook 2409.22 - Timber Appraisal Handbook. The costs include yarding, log sorting and loading, general logging overhead, felling and bucking, temporary road construction, camp mobilization, depreciation, and erosion control. The cost of this activity varies by regulation class (e.g., clearcut size), operability (type of harvesting system required), and size, or age, of the trees (big trees are less expensive on a board foot average).

Administration Area	RegClass 1&2 (ave$/mbf)	RegClass 3 (ave$/mbf)
Chatham	151	354
Ketchikan	135	366
Stikine	136	346

Benefits

The dollar values of outputs used to calculate PNV are the prices consumers would be willing to pay for Forest outputs, whether or not such prices are actually collected by the federal government. Generally many Forest outputs, particularly those with non-market values, are provided either at no charge to consumers or at a charge less than the willingness-to-pay price.

The evaluation of benefits from resource outputs requires a consistent concept of value, although value estimation techniques may vary from resource to resource. For example, timber may be valued using different techniques than minerals or fish, but the concept behind the techniques must be consistent. For further discussion on benefits and net willingness to pay, refer to the 1991 SDEIS.

Timber. The benefits derived from timber are based on appraised value. Value is based on tree size, species composition, amount of defect, and other factors. Timber benefits are measured as pond log value. Pond log values are the estimates price a timber buyer would pay for a log at the mill site. To get the stumpage value of this log, all estimated costs that are incurred to get the log to the mill must be subtracted from the pond log value. The resulting stumpage price is assumed to be the price the timber buyer pays for the log (bid price). Bid price represents money to the U.S. treasury. The average pondlog value is $396 per Mbf.

Hunting, Recreation and Fish. For complete discussion of these resources and the measure of economics and outputs, refer to the 1991 SDEIS and the economics section of the RSDEIS, Chapter 2.

Social And Economic Impacts. Social and economic impact analysis examines the consequences of different land management decisions on the people and communities in and around the Tongass National Forest. The effect of the alternatives on local communities are measured in terms of Forest Service payments to local governments, changes in job and personal income in a local area, and changes in lifestyle and community structure. Economic analysis identifies the consequences in terms of employment, personal income, and payments to governments while social analysis focuses on changes in lifestyles and structure of those communities in and around the National Forest.

Chapter 3 of the Revised Supplement, Social and Economic Environment section, contains a detailed discussion of the economic and social impacts of the alternatives.

Sources of Data. Refer the to the 1991 SDEIS.

Analysis Prior to the Development of Alternatives

Refer to the 1991 SDEIS.

Stage II Analysis

Prior to the formulation of alternatives, each acre classified as tentatively suitable for timber harvest was analyzed to determine the costs and benefits for a range of management intensities (36 CFR 219.14(b)). For the purpose of this analysis, the planning area was stratified into categories of land with similar costs and returns. The stratification also took into account those factors which influence costs and returns such as physical and biological conditions of the site and transportation requirements.

Stage II analysis is used to identify management intensities of timber production for each category of land which results in the largest amount of discounted net revenues. It also identifies those categories of land that are economically sensitive to even slight changes in management intensity. Stage II analysis provides insight into the overall economic condition of the tentatively suitable land base. This enables planners to evaluate and predict potential economic bottlenecks during the next step of the planning process; the formulation of alternatives.

Stage II analysis was conducted for varying management intensities: Intensive even-aged management (i.e., regulation class 1 areas) to very small clearcuts and group selection prescriptions (regulation class 3 areas). There are many economic factors contributing to the calculation of net revenue. The tables below show averages by the categories provided. These are not weighted averages (i.e., based on the number of acres in each category). Table B.11 is a summary of Tongass Stage II analysis. Precise economic figure for various strata and logging intensities can be found in the TLMP planning records and in the 1991 SDEIS.

Table B.11
Stage II Economic Summary by Regulation Class (Revenue per Acre)

Regulation Class 1				
Admin Area	Vol Class	Normal (net$/acre)	Difficult (net$/acre)	Isolated (net$/acre)
Chatham	Low	-177.3	-1,210.7	-1,886.1
	Medium	524.9	-625.7	-1,833.6
	High	2,844.9	757.1	-890.3
Ketchikan	Low	240.0	-805.4	-1,646.6
	Medium	2,191.5	363.9	-1,241.5
	High	3,015.5	1,141.3	1,475.1
Stikine	Low	2,113.5	955.4	-673.6
	Medium	3,000.3	1,369.8	-456.2
	High	4,102.7	2,510.6	813.9

Regulation Class 2				
Admin Area	Vol Class	Normal (net$/acre)	Difficult (net$/acre)	Isolated (net$/acre)
Chatham	Low	-1,947.5	-2,720.5	-3,597.2
	Medium	-1,496.2	-2,144.7	-3,597.3
	High	166.3	-731.1	-2,783.9
Ketchikan	Low	-1,336.4	-2,298.1	-3,375.8
	Medium	83.1	-1,173.5	-3,260.1
	High	887.8	-278.5	951.6
Stikine	Low	345.4	-177.9	-2,252.2
	Medium	1,091.5	193.1	-2,085.3
	High	1,919.0	1,251.3	-863.7

Regulation Class 3				
Admin Area	Vol Class	Normal (net$/acre)	Difficult (net$/acre)	Isolated (net$/acre)
Chatham	Low	-11,111.8	-12,107.6	-14,226.7
	Medium	-11,103.1	-11,487.3	-14,437.1
	High	-10,350.1	-9,790.0	-14,338.0
Ketchikan	Low	-9,812.0	-11,551.9	-14,086.8
	Medium	-8,963.0	-10,564.4	-15,623.4
	High	-7,807.8	-8,961.8	-1,973.9
Stikine	Low	-7,299.0	-7,129.7	-11,934.6
	Medium	-6,539.9	-6,968.6	-12,008.5
	High	-6,997.5	-6,392.5	-11,054.6

Formulation of Alternatives

A Forest Plan alternative is a mix of management prescriptions applied in specific amounts to areas of the Forest to achieve desired management objectives and goals. Each alternative within the range of alternatives was developed in accordance with the National Forest Management Act (NFMA). The alternative development process also follow the National Environmental Policy Act (NEPA) procedures contained in 40 CFR 1502.14.

Alternative Development. The alternative development process began in 1988 with a review of Forest issues, concerns, opportunities, and resource inventories; resource production capabilities identified in the analysis of the management situation; and applicable planning direction. Based on a review of these items, resource management options were developed. These management options were designed to incorporate issues, reflect a particular level of management emphasis, and serve as a potential building block for Forest management alternatives. The alternatives presented in the RSDEIS represent the third iteration of management alternatives (the first was the DEIS in 1990, then the SDEIS in 1991).

Land Use Designations and Management Prescriptions. The identification of land areas which contribute to the goals and objectives of each alternative was an integral part of alternative development. Working from the management options developed earlier, areas of the Forest were identified and assigned a management strategy. These "Land Use Designations," or LUDs are portions of the forest managed for the same goals and objectives. They are physical units and can be delineated on a map.

The next phase was to develop a range of silvicultural activities that can occur within the LUD areas over the planning horizon. Silvicultural prescriptions represent the potential sets of timber management activities that can be implemented. These prescriptions are incorporated into the FORPLAN model, which seeks to schedule activities in a manner consistent with management constraints and objectives.

Iterative Process. The analysis began with a series of tests designed to calibrate and verify the operation of the models. Upon completion, analysis of individual alternatives began. Under their particular constraints, each model was then solved using an objective function to maximize timber harvest volume in the first decade of the planning horizon.

Description of Standard Model Shell

A standard FORPLAN model shell was developed to ease the task of developing the individual models used to analyze alternatives. A description of what is in the model shell is found in this appendix, The Forest Planning Model. The shell has a standard set of identifiers, treatment types, activities, outputs, cost and value data, objective functions, prescriptions, and yield data. Constraints and analysis area allocations unique to each alternative are then added to customize the model.

Description of Common Model Constraints

Constraints are used within a model in order to provide an accurate mathematical representation of the alternative. A set of common constraints were applied to the standard model shell during the analysis of alternatives. These common constraints fall into four categories: 1) Congressionally and Administratively removed, 2) Management Requirements, 3) timber policy constraints, and 4) operational constraints. Other constraint sets, such as wildlife, visual, and discretionary constraints, were modeled for all alternatives, but the amount and extent of the constraints varied by alternative.

Congressionally and Administratively removed areas. In FORPLAN, all lands identified as not suitable for timber harvest are designated to non-timber prescriptions. These lands include Congressionally (e.g., wilderness) or administratively withdrawn from timber harvest (see Revised Supplement Forest Plan, Appendix A, Timber Land Suitability).

Management Requirement (MRs) constraints. These constraints are incorporated into the FORPLAN model so management requirements and standards are achieved. Procedures for defining the MRs are established by the planning team. The MRs are taken from 36 CFR 219.27 and generally represent requirements that are outside of Forest Service authority to change. They are based on statutes and regulations in contrast to manual direction or agency policy. MRs apply to all benchmarks and alternatives.

Timber Policy constraints. These are required to ensure that all timber harvest meets sustained yield, culmination of mean annual increment, and dispersion requirements. These constraints are in all benchmarks and alternatives.

Operational constraints. These constraints are needed to ensure that the results obtained from FORPLAN are acceptable and implementable on the ground. These constraints are within agency control, but there is little discretionary control regarding their application at the Forest level.

Development and Testing of Alternatives

This section describes the methods applied in the formulation and analysis of alternatives. Alternatives were developed to meet a variety of issues, concerns, and objectives. In all, nine alternatives were developed. These range from a non-market emphasis (Alternative 1) to a production emphasis (Alternative 7) to a representation of the current plan (Alternative 9). The alternative themes and corresponding land allocation patterns were developed by the Tongass Land Management Planning Team. The decisions were based on the analysis of the management situation, public comment, and other concerns generated from the DEIS or SDEIS.

Earlier in the appendix ("Development of regulation classes") unique attributes of the nine alternatives were discussed. This discussion primarily dealt with the analytical methods by which these attributes were modeled.

Alternative Flowcharting

Once an alternative's theme, goals, resource objectives, and range of management intensities was determined, the process of allocating land to Land Use Designations (LUDs) was interpreted into a flowchart (i.e., a "decision tree"). Each of the almost 900,000 20-acre capability areas flows through this decision structure until it is allocated to the appropriate LUD consistent with the theme, goals and resource objectives of each alternative.

The flowchart is made up of a series of "question" or decision nodes. Each node asks a yes-or-no question regarding an aspect of the land's attributes. This process continues until all capability areas have been allocated to a Land Use Designation. There is a separate flowchart for each alternative. Every acre passes through the flowchart for LUD allocation.

The flowchart is a symbolic representation of the LUD allocation process. These flowcharts also aid in the design of the computer program (in ARC-INFO) that formats the allocation decisions into FORPLAN inputs. Flowcharts for each alternative are available in the planning records. Due to their size, inclusion into this document was not possible.

The allocation patterns for each alternative generated by the flowcharts were then mapped and reviewed at the field level. Adjustments were made where necessary to account for local knowledge and concerns not addressed within the flowcharts. These additional considerations were made consistent with the theme of each alternative.

The Revised Supplement Alternatives

Each of nine alternatives of the Revised Supplement is based on an alternative or proposed alternative from previous efforts. The 1992 Alternative P is used for five of the alternatives, 1992 Alternative D for two, 1992 Alternative A for one, and one alternative is based on the current plan (1979 Plan as amended and 1992 Alternative C).

To develop the maps and models for each of the alternatives we began with the "base" alternative map and then added the features of the new RSDEIS alternative. The table showing the components of each alternative is found in Chapter 2 and will not be repeated here. The components of the alternatives, such as deer wintering habitat and VCU thresholds, will be discussed in this section. The discussion on why these and other unique components were added to alternatives is found in other parts of the document.

Analysis Of Constraints on Alternatives

The purpose of identifying constraints and estimating their effects on alternatives was to find the most efficient and realistic means of addressing planning issues. Many constraints were considered for incorporation into the models. The purpose of these constraints is also to act as proxies to facilitate the developing of model results that are realistic, implementable, legal, and consistent with the intent of the standards and guidelines. Unless stated otherwise, all alternatives and sensitivity runs maximize timber harvest volume in the first decade then "rollover" and maximize present net value (PNV). This is the same procedure that was used in the 1991 SDEIS.

Revised Supplement Sensitivity Analysis

Much of the information obtained from previous sensitivity runs are still applicable and relevant to Revised Supplement alternative analysis. Sensitivity testing at the Forest Plan level primarily deals with changes in land base, economics, harvest volume attributes, and operational constraints. Although many functional aspects of the models and databases have changed the results of the tests have varied little over the years (relatively speaking). The only significant change from the SDEIS in terms of model structure is the incorporation of four regulation classes (instead of three), the use of price trends on timber values, and a more spatially explicit land allocation procedure. Mechanically, the models of both the 1991 SDEIS and Revised Supplement are very similar. The modeling for both provide similar results and are effected proportionally the same with the inclusion of like FORPLAN constraints. For these reasons, SDEIS sensitivity runs provide valuable information for the examination and comparison of RSDEIS alternatives. The sensitivity run results printed in the SDEIS document will not be reprinted in this appendix.

One thing learned from the many sensitivity runs was that the alternatives each responded similarly in regards to constraint addition and elimination. In other words, the results of a test on one alternative could often be proportionately applied to any other alternatives provided all other constraints were similar. With this knowledge, constraint testing could be applied to a few of the alternatives and the results could be used to estimate the impact on other alternatives. This was done through the use of regression analysis; the most commonly use independent variables were acres in regulation classes 1 and 2 and acres of normal operability lands. The need for this regression approach was to minimize the number of FORPLAN runs that had to be made. Each alternative is composed of three models. Having nine alternatives creates the need for 27 different runs for each sensitivity test. Some of the larger models can take six or seven hours to complete.

The section below lists the outputs derived from the FORPLAN runs under different constraint formulations. Since the Tongass models are primarily concerned with timber management, the outputs used for comparison will be the allowable sale quantity for each alternative. This is the volume of timber, measured in millions of board feet, that is scheduled for harvest on a non-declining basis. This measure includes both sawlog and utility volume.

Effect of a Positive Net Revenue Constraint. Estimates of all timber harvest-related costs and revenues are included in the FORPLAN models. The alternatives are all run under a maximization of present net revenue objective function. Although FORPLAN may report a positive "net revenue" in some or all decades, some alternatives do show that negative revenue decades will occur. To determine the impact of positive net revenue per decade, a constraint that forces positive revenues for each decade of the planning horizon was added to the FORPLAN models. Of course, this constraint does not truly indicate the amount of timber revenue expected but provides insight into effect of economics to volume of profitable timber. FORPLAN does not do its accounting in accordance with any Forest Service or government accounting office. This sensitivity test simply allows planners to see the relative impact to harvest volume based on changes in economics. The resulting allowable sale quantities (ASQs) are shown below.

Table B.12
Impact of a Positive Net Revenue Constraint

Alternative	Original ASQ	Sensitivity Run	Percent Change
1	0	0	0%
2	489	368	-25%
3	278	206	-26%
4	145	144	0%
5	138	137	0%
6	362	253	-30%
7	689	508	-26%
8	364	258	-29%
9	513	373	-27%

The results of this test vary most significantly between two general alternative forms: short rotation even-aged management and long rotation even-aged management. Alternatives 4 and 5 have minimum 200-year rotations for second growth. This being the case, the available old-growth must be "metered" out for the entire planning horizon. Since this volume is projected to be quite profitable, the model is able to maintain the same harvest level. The other alternatives are unable to do this due to the harvest of second growth. A portion of this second growth is projected to be unprofitable and must be "supplemented" with the harvest of old-growth to maintain profitability. This, in essence, spreads out the harvest of oldgrowth over a longer period of time thus reducing first decade harvest volume.

In terms of economics, there are some very interesting things about Tongass timber. One fact that is quite surprising is the volatility of Tongass timber to changes in price. Stage II economic analysis has shown that a 20% increase in pond log value can increase the profitable acres by 50%. Much of the available timber on the Tongass is right on the economic margin. This not only makes supplying a consistent economic sale program challenging, it also makes constraining for timber economics in a 160-year model possibly unrealistic. Hence, ASQs will be determined without a no-below cost constraint. In addition, a volume of timber less than the ASQ volume will be shown as the probable economic portion of the ASQ. This volume is based on the mix of operable lands historically harvested and represents approximately 80 percent of the ASQ volume.

Constraints on Logging Operability. There are three categories of mapped logging operability on the Tongass; normal, difficult, and isolated. The rate at which timber is harvested from these three different classes has always been of interest. Too much volume off the easier-to-harvest normal operable areas could jeopardize the ability of the Tongass to supply profitable future timber sales. There is a tendency for FORPLAN to harvest disproportionality from the three classes. In order to maximize Present Net Value (PNV), the more profitable timber lands are harvested earlier in the planning horizon. A constraint was developed for all alternatives that requires each decadal harvest to be composed of no more than the forest-wide proportion of normal operability lands. This is approximately 76% of the tentatively suitable land base. Historic logging trends have shown that normal operable lands typically make up about 94% of the total harvest acres (difficult about 5% and isolated 1%). This 94-5-1 mix of operability is the result of providing an economically feasible timber sale program. This proportion is based on 14 years of harvest data (1980-1994).

To test the impact of harvesting operability classes in their historic proportions, FORPLAN was constrained to mimic scheduling. All other constraints remained in the model (limits on high volume oldgrowth, for example). The results of this run are shown in Table B.13 and compared to the ASQ and NIC 1 components of each alternative.

Table B.13
Impact of Constrained Historic Harvest of Operability

Alternative	ASQ (MMbf/yr)	ASQ, NIC 1 Component	Historic Operability Constraint (MMbf/yr)
1	0	0	0
2	489	406	460
3	278	232	241
4	145	121	115
5	138	114	109
6	362	300	316
7	689	577	640
8	364	305	317
9	513	474	475

This information indicates that the harvest of operability classes is well represented by the use of the non-interchangeable component (NIC) concept. Only two of the alternatives indicate that constraints on the harvest of operability class reduce the ASQ below the calculated NIC 1 value. These alternative, 4 and 5, have minimum rotation length of 200 years. This test indicates that a higher proportion of difficult and isolated operability stands may be required to achieve NIC 1 volumes than is currently used in the NIC 1 estimates.

Impact of Precommercial Thinning. In order to accurately assess the economics, effects, and requirements of precommercial thinning, all FORPLAN data sets included known benefits derived from thinned stands. The main timber-related benefits resulting from thinned areas, when final harvested, is reduced logging cost, increased value, and reduced minimum rotation age (in some cases). To determine the ASQ dependence on this activity, a run that did not allow precommercial thinning was compared to the original runs, which allowed precommercial thinning. The results are shown in Table B.14

Table B.14
Impact of No Precommercial Thinning

Alternative	Original ASQ	No Precom Thin	Percent Change
1	0	0	0%
2	489	465	-5%
3	278	270	-3%
4	145	144	0%
5	138	137	0%
6	362	347	-4%
7	689	640	-7%
8	364	349	-4%
9	513	437	-5%

FORPLAN schedules precommercial thinning to increase the ASQ and improve the economics of the second growth timber stands. These results demonstrate the need of precommercial thinning to achieve the ASQ and meet the non-declining yield constraints. Without adequate levels of precommercial thinning, the sustainability of first decade harvest volumes at the ASQ level is unlikely. Precommercial thinning has this effect due to the existing age class structure of the forest. The key factors in ASQ calculation is the length of time before second growth timber is available for harvest and the volume that is harvested from these acres. Anything that reduces the "old-growth liquidation period" will tend to increase ASQ estimates. Other activities that may have similar effects would be a reduction in merchantability requirements or multiple thinnings.

The only benefits associated with precommercial thinning in this analysis are in terms of increased timber values. There are other benefits associated with precommercial thinning that have yet to be fully quantified. For instance, enhancement of wildlife habitat and improved vigor of the forest stand (which improves disease resistance) are benefits thought to be derived from thinning. When these values are finally quantified, precommercial thinning will show a higher economic return.

Factors Effecting the Allowable Sale Quantity Calculation. As discussed earlier in the appendix, constraints have been added to the FORPLAN models to account for a variety of missing, miscoded, and unaccounted information that may reduce the feasibility of FORPLAN-generated results. These values are referred to as Model Implementation Reduction Factors (MIRFs). In order to estimate the impact these constraints have to the models, a series of runs were made without them. All other constraints were left in place.

Table B.15
Removing the MIRF Constraints

Alternative	Original ASQ	MIRF Removed	Percent Change
1	0	0	0%
2	489	605	24%
3	278	340	23%
4	145	162	11%
5	138	152	10%
6	362	415	15%
7	689	820	19%
8	364	450	24%
9	513	614	20%

The impact of MIRFs vary due to the unique components of each alternative. In alternatives containing constraints for items such as small Habitat Areas and harvest thresholds, the smallest increase occurs. While the proportions of MIRF constraints are similar among all alternatives, there is "overlap" between MIRF and other constraints, thus accounting for the above differences. For example, some of the MIRF constraint is achieved by using the same acres set aside for small Habitat Areas.

Estimated Impacts of Three FORPLAN models. As discussed earlier, there are three separate FORPLAN models representing the Tongass National Forest. The main reason behind this is computer hardware and software limitations. The desired level of detail combined with size of the Tongass, made for very large FORPLAN models. The only option, other than reducing the level of detail, was to split the Forest into three separate FORPLAN models. Typically, as an area is disagreggated into additional models, levels of output, when summed, are different than that of the whole model. This is primarily due to limiting solution options as the model's land base is decreased. In order to assess possible resource production inefficiencies within the Tongass models, a test was conducted to estimate the effect of three models instead of one.

The best possible test would have been to put the three area models together and regenerate the solution. This is impossible. Instead, each of the three Forest models that make up one alternative were divided into three again. There are now nine different FORPLAN models that, when combined, represent the Tongass.

For this test, the land allocation for Alternative 7 was selected. Because we wanted each of the nine models to have land available for harvest, alternative D provided the best opportunity since it has the greatest amount of land available for timber harvest. Table B.16 shows the results of this test.

Table B.16
Impact on ASQ by Model Disaggregation

Area	Segment 1	Segment 2	Segment 3	Total
Chatham	55	81	49	185
Ketchikan	110	81	86	277
Stikine	77	67	69	213
Total				675

Comparing these results with the original Alternative 7 ASQ volume of 689 MMbf, we see that there is a decrease of approximately 14 MMbf when using the disaggregated models. This represents an ASQ decline of 2 percent when going from three models to nine. Assuming the same proportionate change when going from one model to three we can estimate the ASQs that would have resulted if we had the computer capabilities to make one large model instead of three. Table B.17 contains these estimates.

Table B.17
Alternative ASQs Estimated from One Model Instead of Three

Alternative	Original ASQ	One Model Run
1	0	0
2	489	499
3	278	284
4	145	148
5	138	141
6	362	369
7	689	703
8	364	371
9	513	523

From the information obtained from this test, we conclude that splitting the Forest into three models is reasonable since the results do not vary significantly under further aggregation.

Results of Alternatives

The results of the alternatives under all congressional and administrative constraints, Management Requirement constraints, timber policy constraints, and operational constraints are shown below.

This section does not show all the outputs and activities associated with the alternatives. Many timber related outputs are found in other Revised Supplement documents. Results shown in this Appendix are selections of some of the key outputs and activities closely associated to the economic efficiency and harvest schedule of the models. FORPLAN reports are available in the Planning Record.

Allowable Sale Quantity, Suitable Acres, and Scheduled Acres

The Allowable Sale Quantity (ASQ) and suitable-scheduled acres are shown in Table B.18 for each alternative. The ASQ is shown here as the first decade harvest volume in board feet (sawlog and utility). This is the decadal volume possible under the constraints and land allocations represented by the various alternatives. The NIC 1 component represents a volume from the estimated ASQ from the most operable ground and based on historic harvest. This volume is the likely timber sale program quantity. The suitable acres (in 1000s) are lands on which timber harvest is permitted based on LUD and alternative-specific management attributes (Riparian Option 1, for example). The scheduled acres represent the amount of land needed to provide the respective ASQ volumes for perpetuity.

Table B.18
ASQ, Suitable Acres and Scheduled

Alternative	ASQ (MMbf/year)	ASQ-NIC 1 (MMbf/year)	Suitable Acres (1000s)	Suitable-Scheduled (1000s)
1	0	0	73	0
2	489	406	1533	1252
3	278	232	1194	831
4	145	121	1512	879
5	138	114	1405	827
6	362	300	1405	1081
7	689	577	2050	1628
8	364	305	1395	1085
9	513	474	1874	1325

A thorough list of alternative outputs can be found in Chapters 2 and 3 of the RSDEIS and in the TLMP planning records.

Appendix C

Community Deer Use Maps

APPENDIX C

Community Deer Use Maps

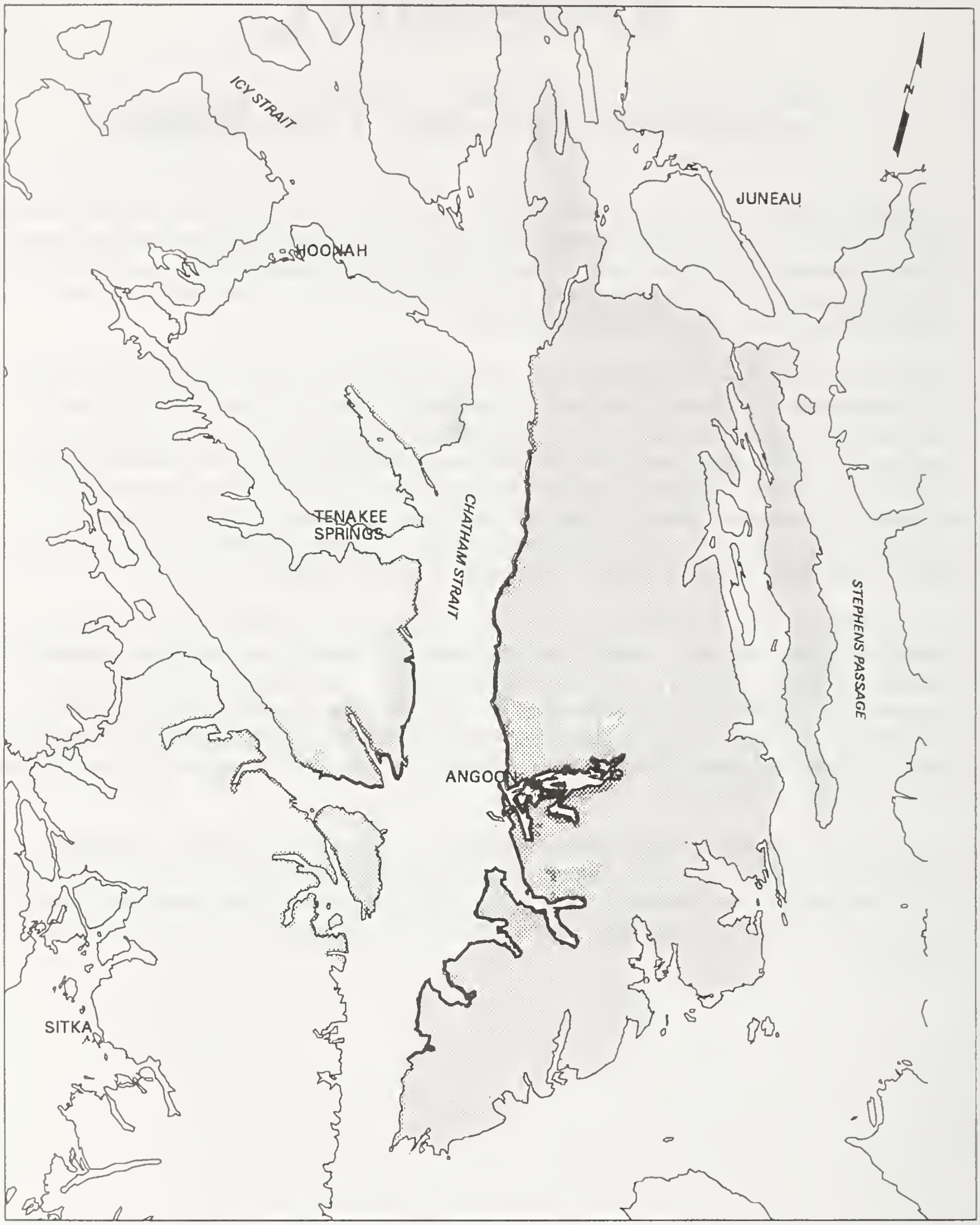
The following maps are constructed from data derived from Alaska Department of Fish and Game (ADF&G) hunter surveys. These surveys are sent to a random selection of hunters who have obtained licenses in a particular year. While there is some debate as to the accuracy of the information that is returned, it is the best that is available on a regular basis and so is used here to represent areas where communities regularly hunt.

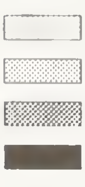
Some of the debate about the data concerns the accuracy that is reported by individual hunters, and centers around two main issues, namely place and numbers. Concerning place, many hunters feel proprietal about an area that is special to them and where they may regularly have good success in obtaining deer. Such hunters may be reluctant to share this knowledge with a State agency, fearing that if the information is made public, other hunters will come in and compete for the available deer. The second issue concerns the numbers of deer taken and reported. It is possible that hunters may under-report the numbers of deer taken, believing that high numbers may lead to restrictions in allowable harvest at some future stage.

It should also be noted that while Juneau and Ketchikan are not considered to be Subsistence Community in the strict legal sense, Juneau and Ketchikan sport hunters take a considerable number of deer each year off the Tongass National Forest. These hunters compete in some instances with hunters from subsistence communities, and may, according to State hunting regulations, be restricted before subsistence users should this become necessary. For these reasons, it is useful to see where these sport hunters are taking their deer, and the maps for these two communities are included in this appendix.

Two sets of maps are included for most communities. The first map indicates the traditional hunting areas for each community and how many households traditionally use each area. (Data for this first map was not available for four communities.) The second map shows the areas where each community obtained their deer in recent years, and the relative amount obtained from each area.

Angoon's Traditional Household Hunting Areas

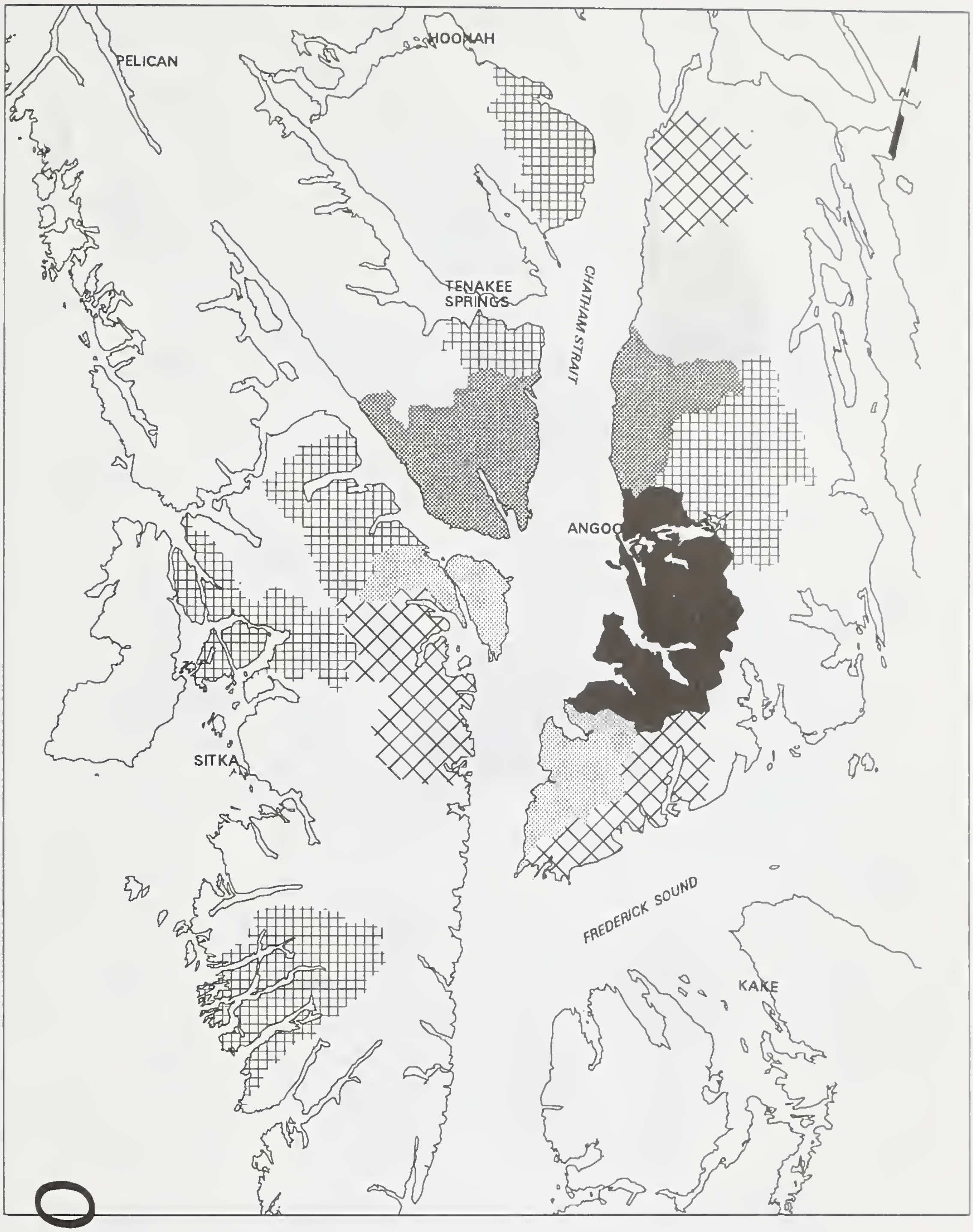




During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

Percent of annual Angoon deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

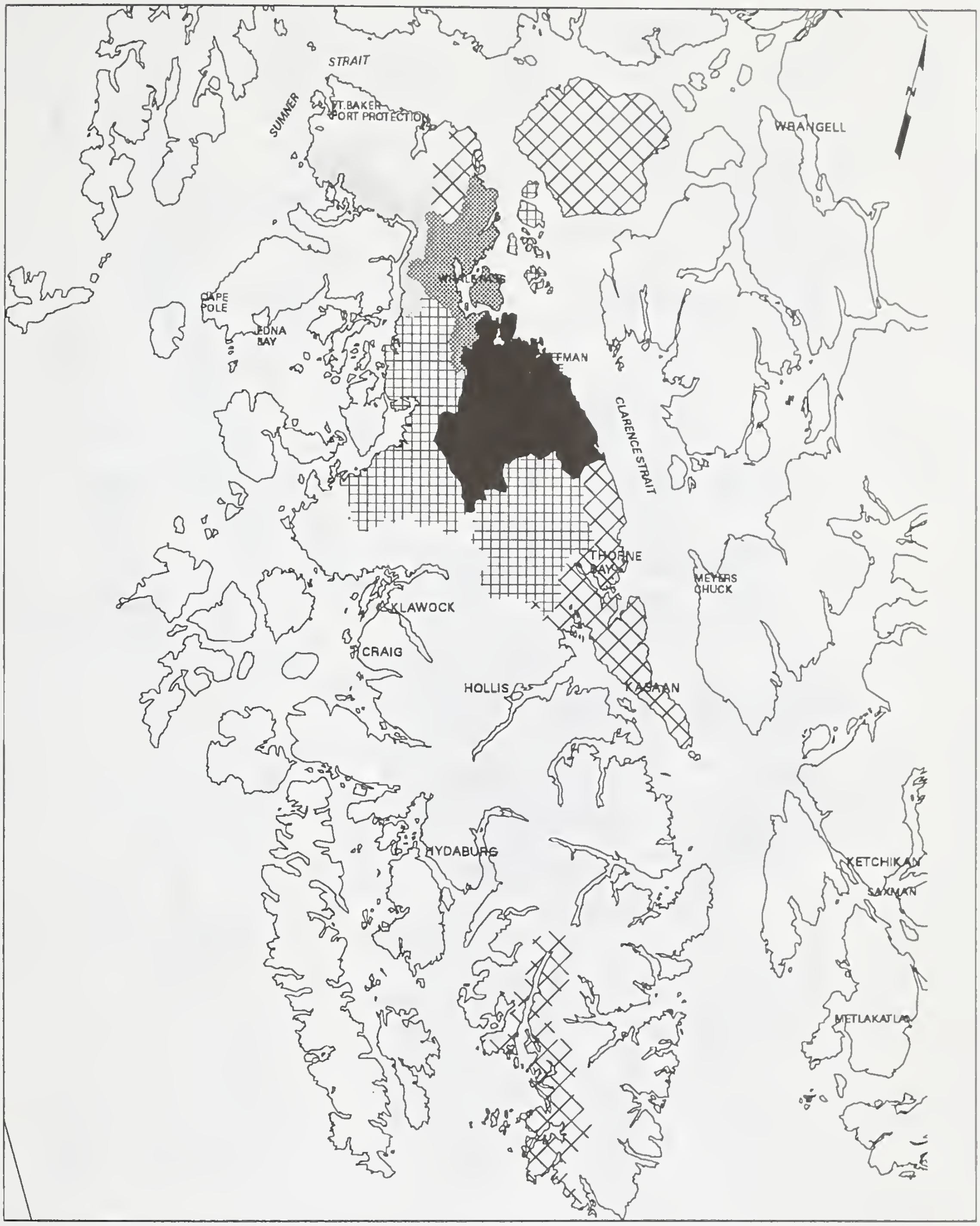
Coffman Cove's Traditional Household Hunting Areas

- 1-5 % of Households
- 6-15 % of Households
- 16-25 % of Households
- > 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

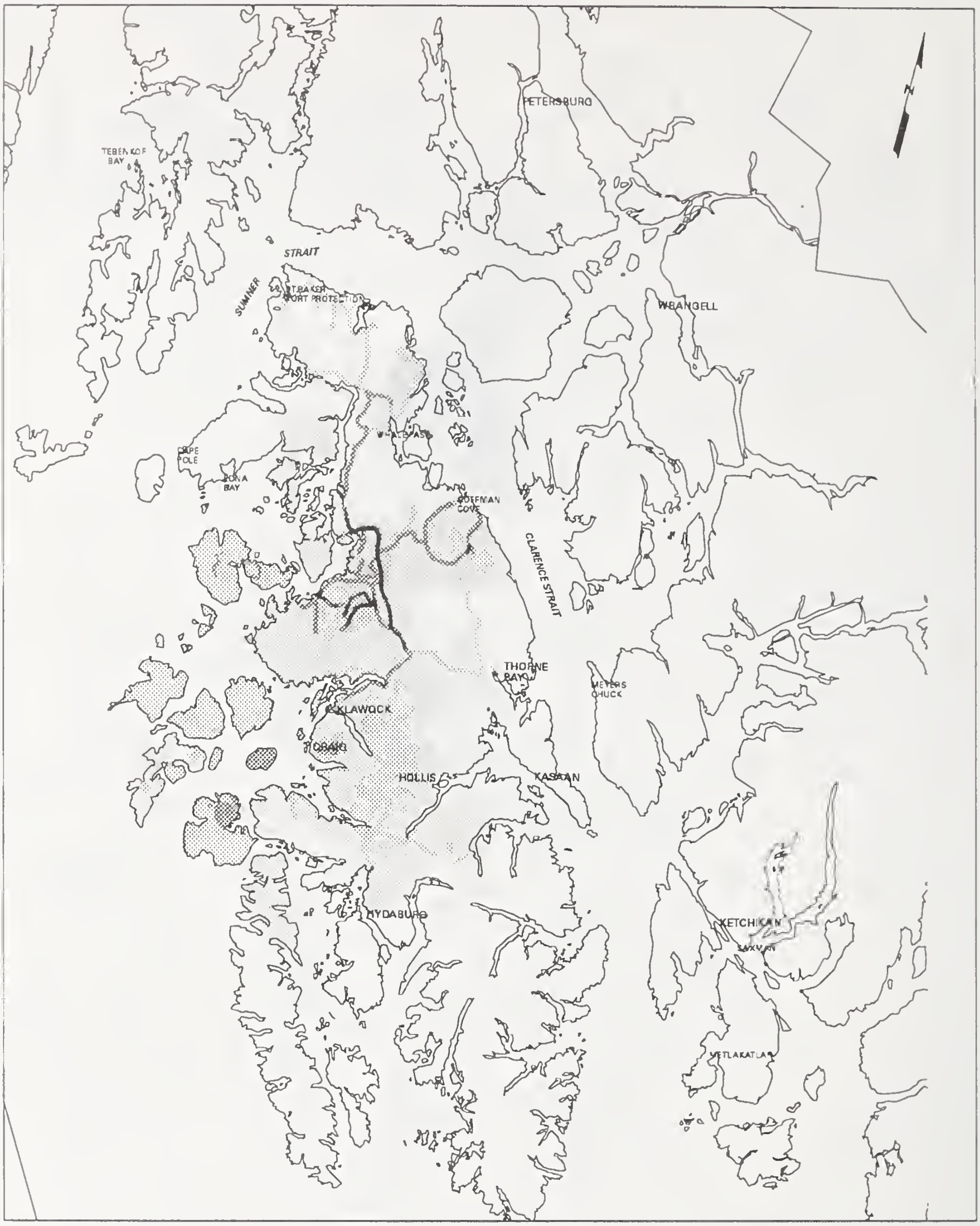
Percent of annual Coffman Cove deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Craig's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

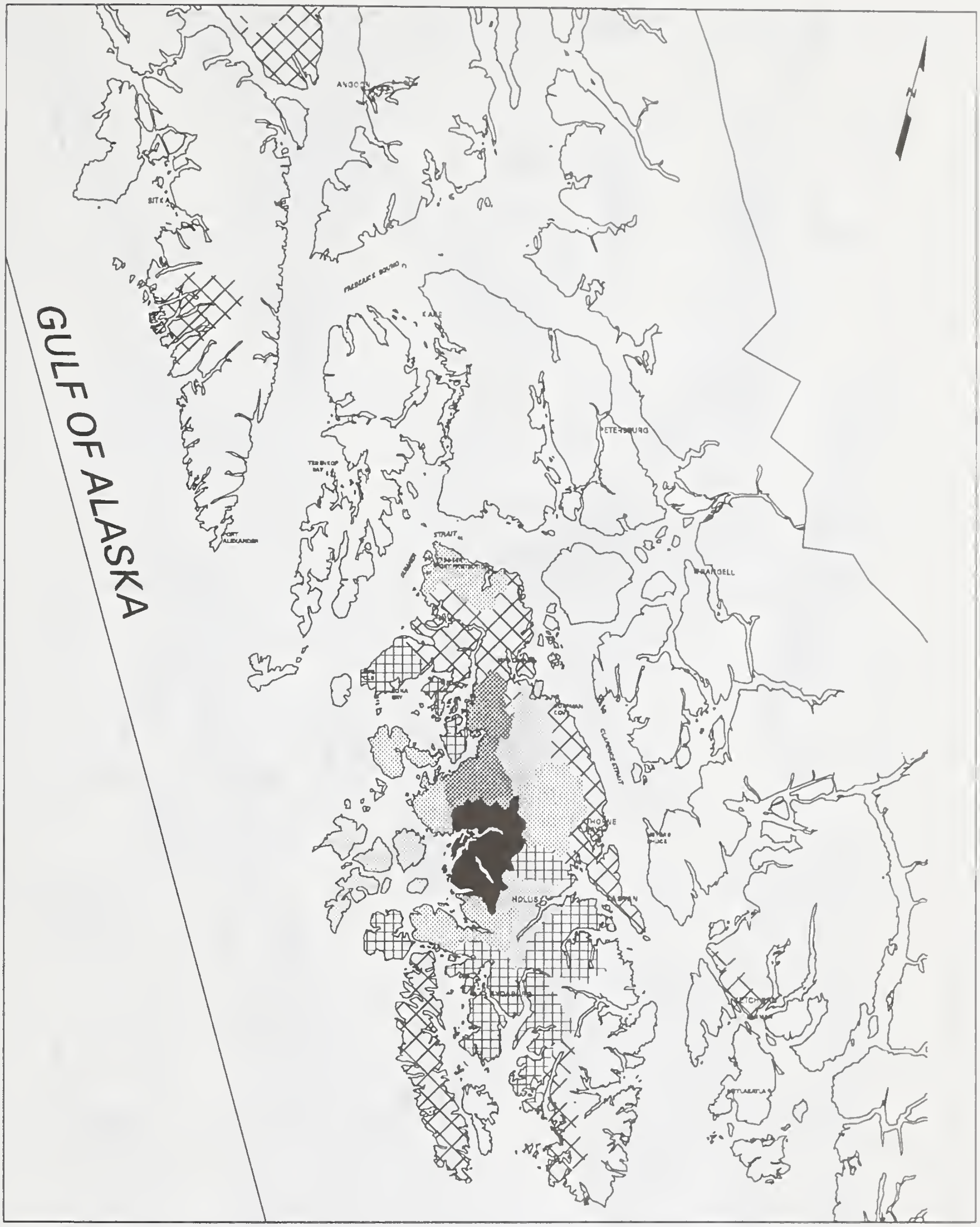
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

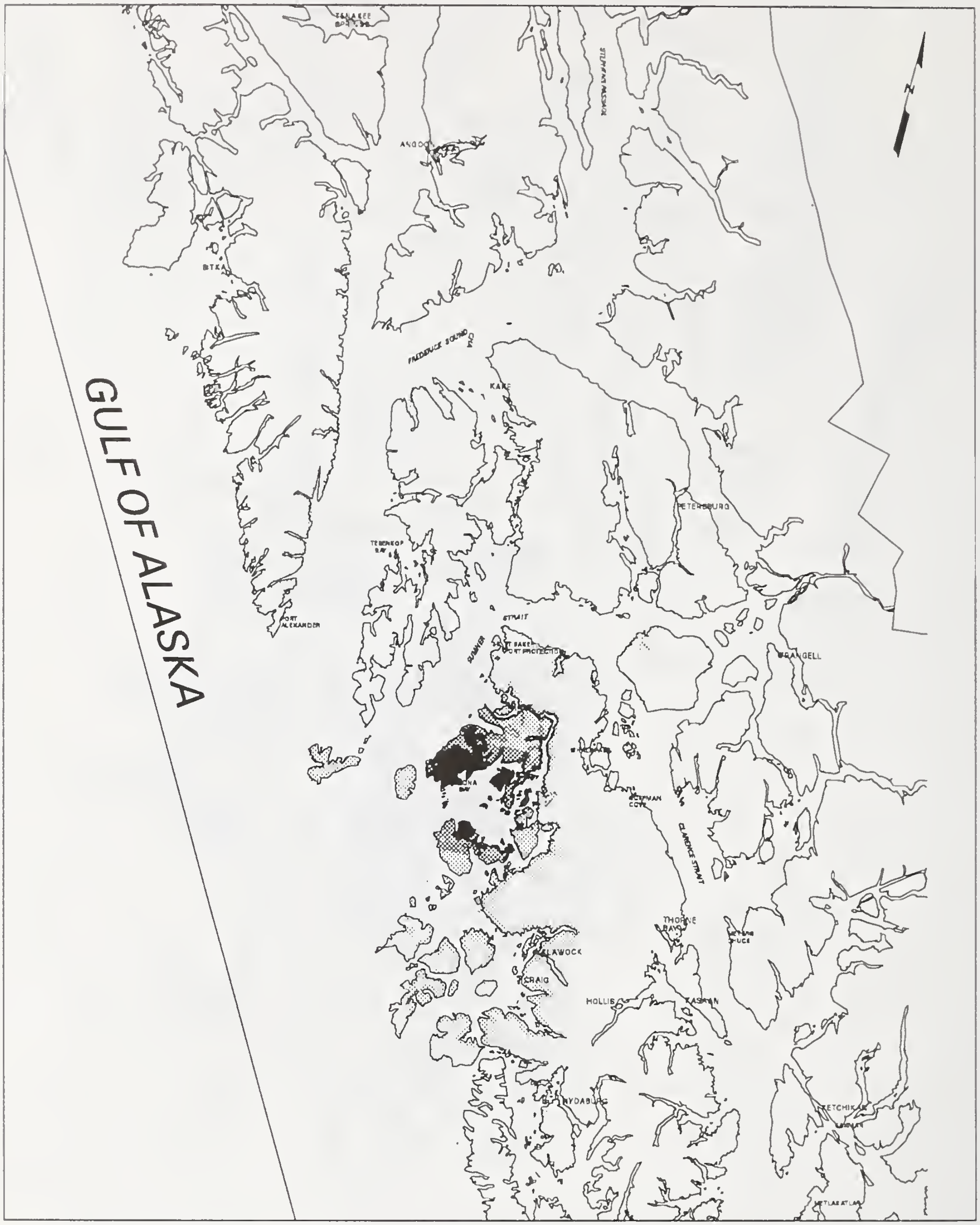
Percent of annual Craig deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Edna Bay's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

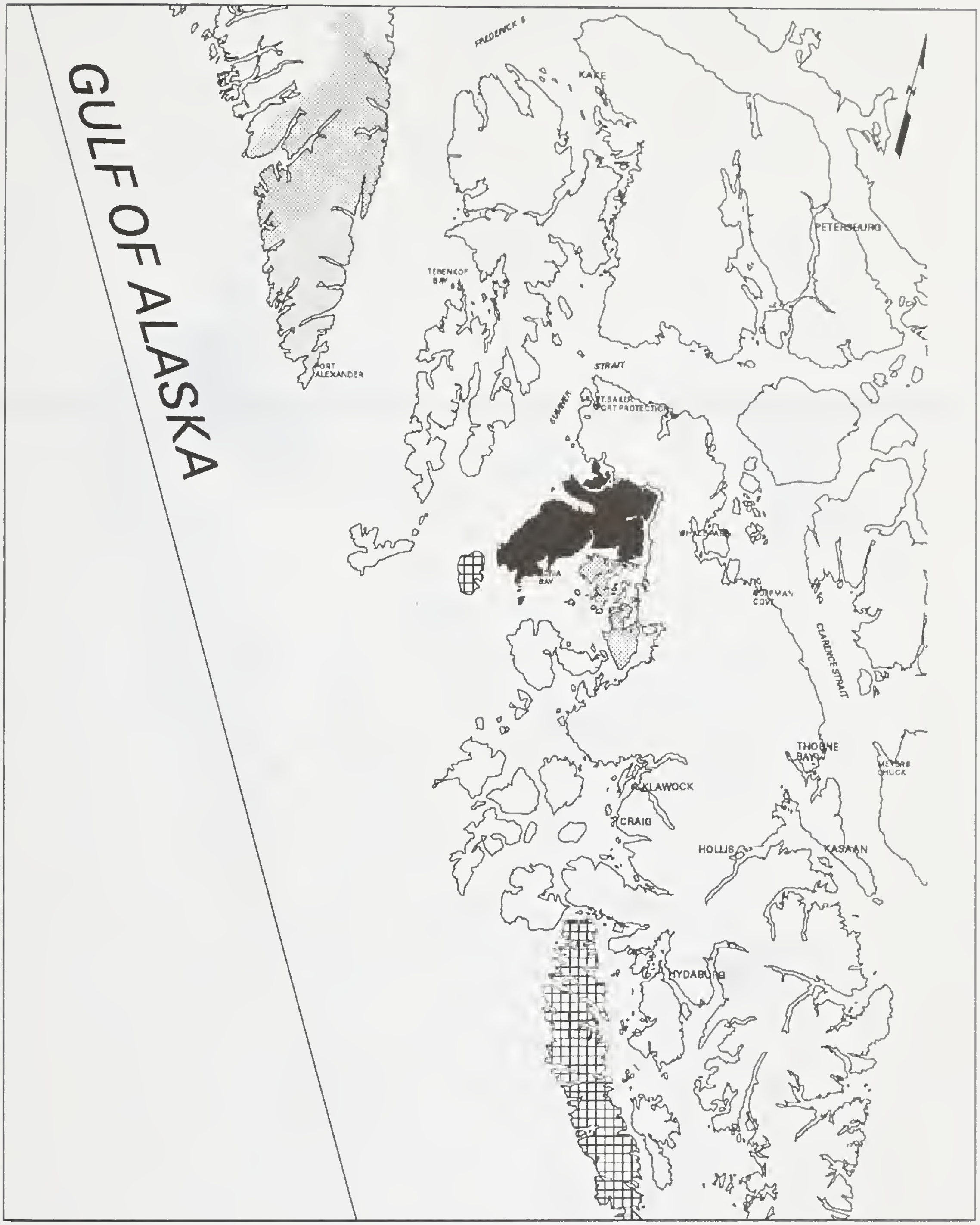
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

Percent of annual Edna Bay deer harvest by WAA, 1987-1994

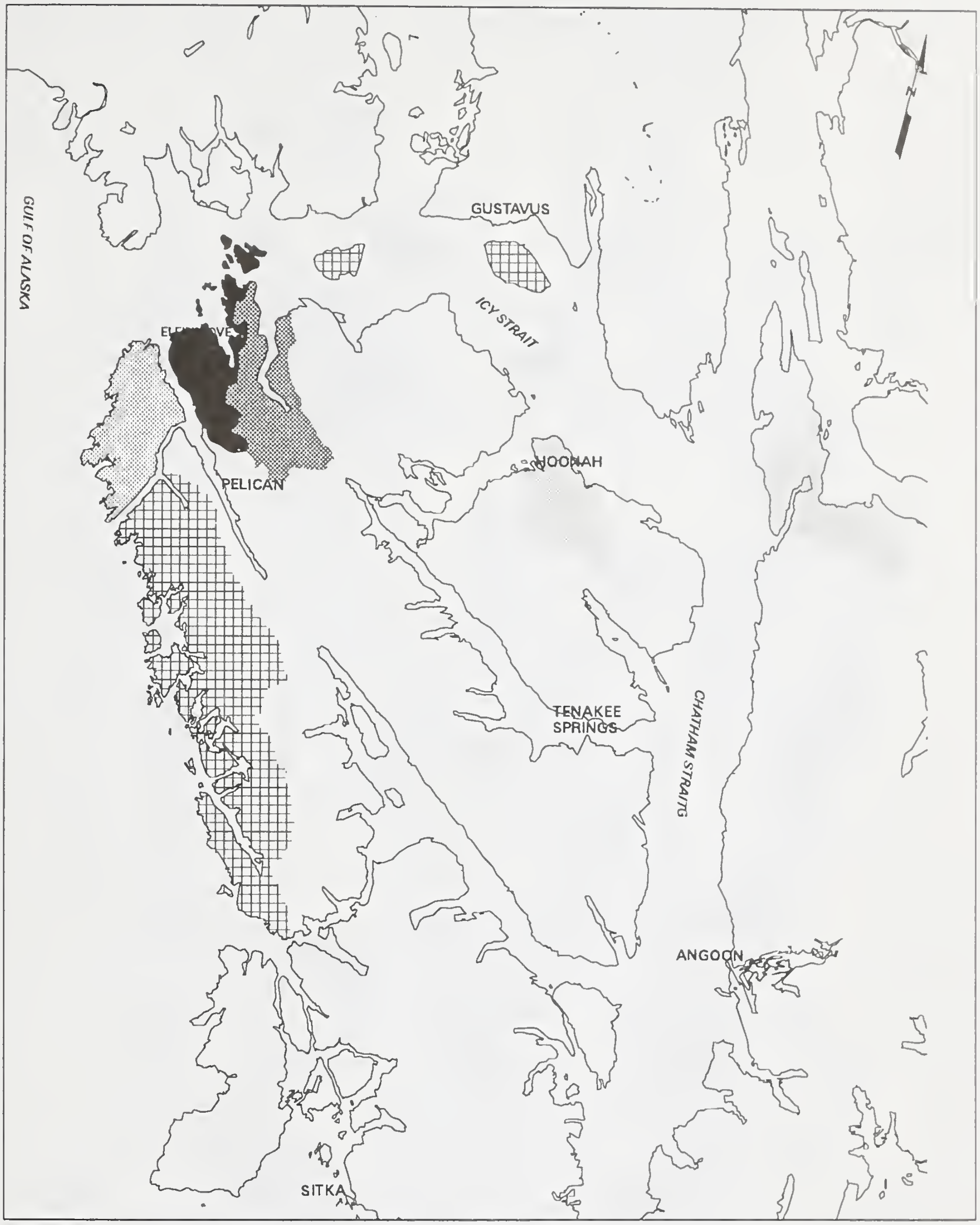


Less than 1 Percent
One to 3 Percent
Three to 5 Percent
Five to 10 Percent
Ten to 15 Percent
Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Traditional Household Hunting Data from TRUCS not Available for Elfin Cove

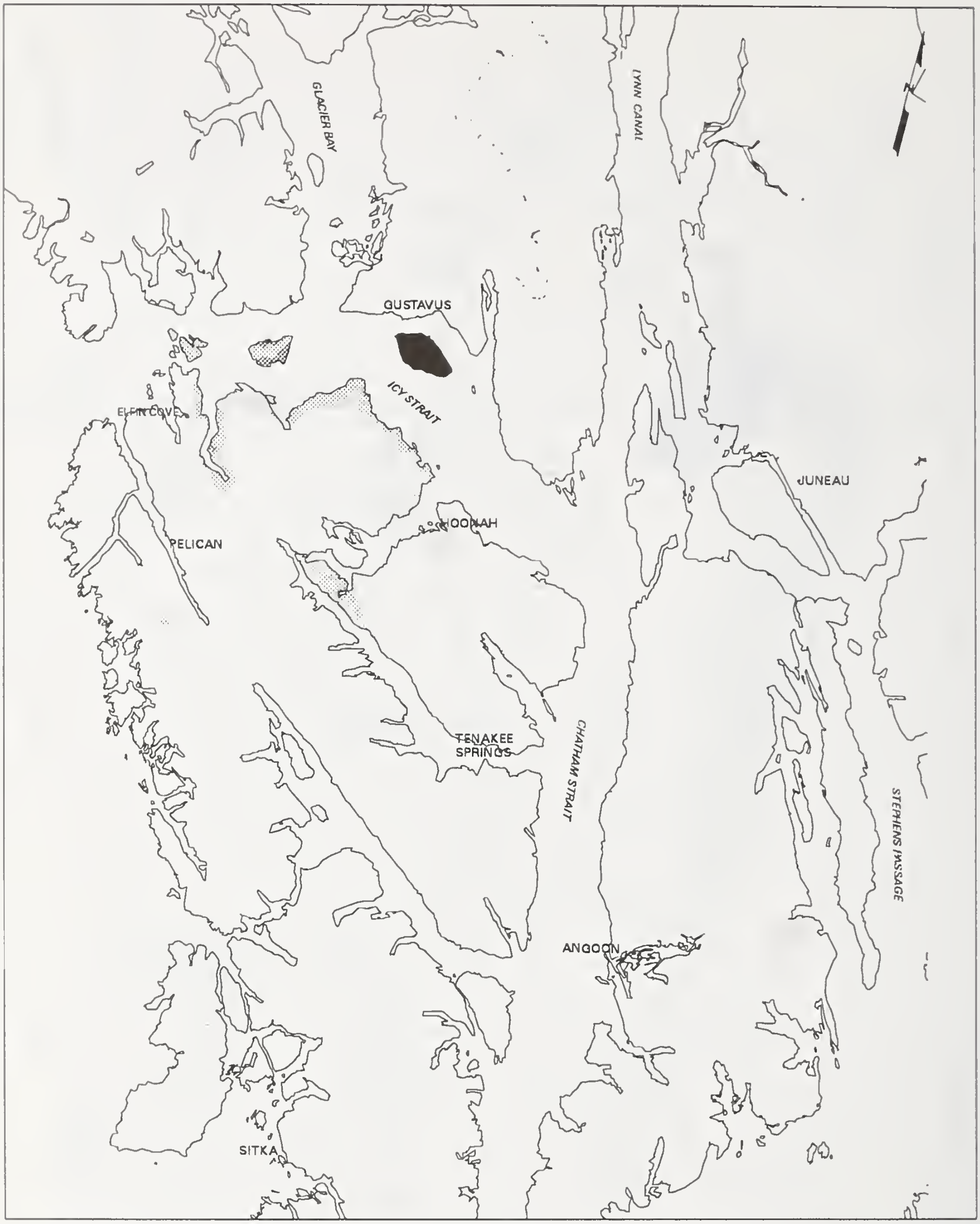
Percent of annual Elfin Cove deer harvest by WAA, 1987-1994



⊠	Less than 1 Percent
▦	One to 3 Percent
░	Three to 5 Percent
░	Five to 10 Percent
▒	Ten to 15 Percent
■	Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Gustavus' Traditional Household Hunting Areas



During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

1-5 % of Households

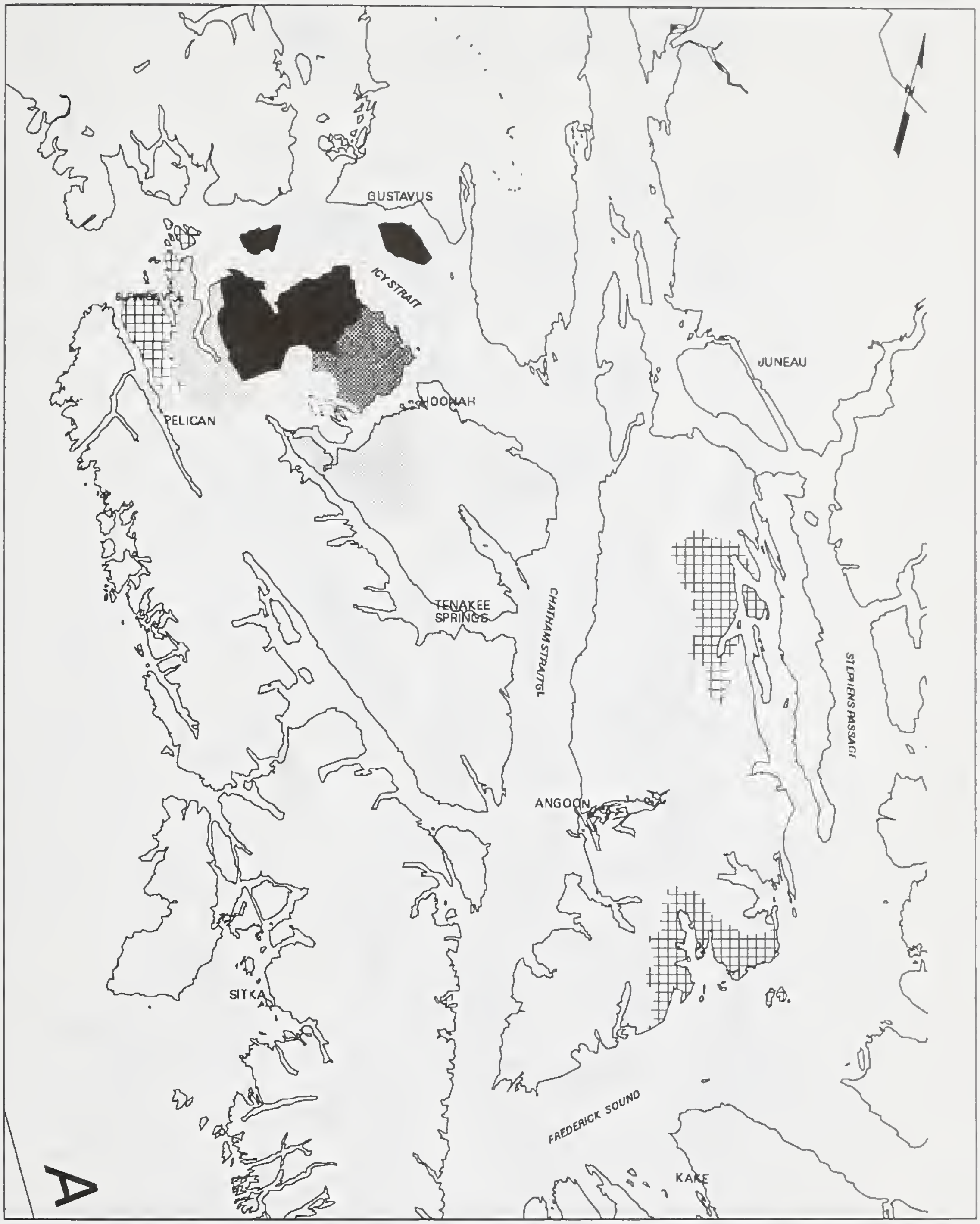
6-15 % of Households

16-25 % of Households

> 25 % of Households

Source, TRUCS 1988

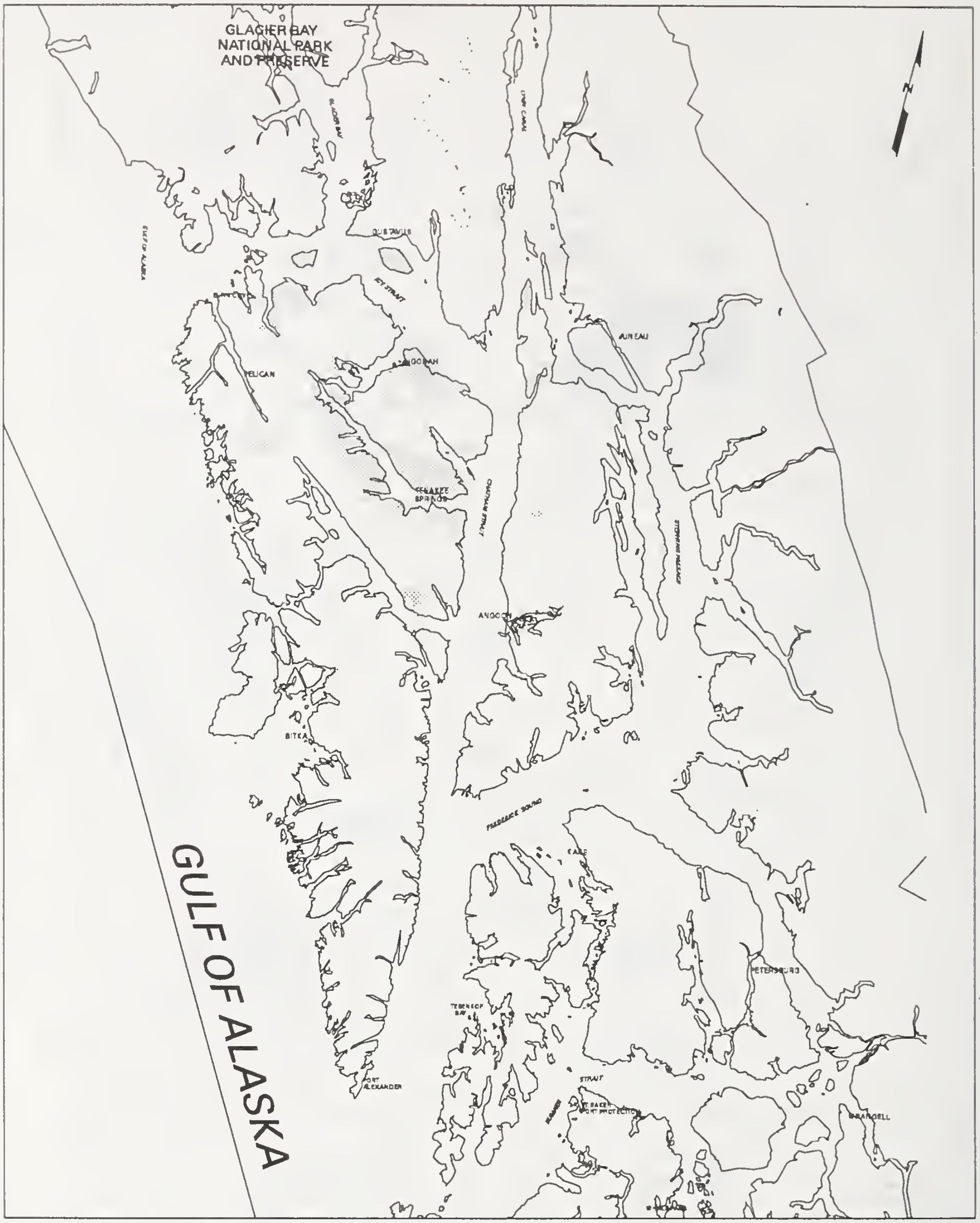
Percent of annual Gustavus deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Haines' Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

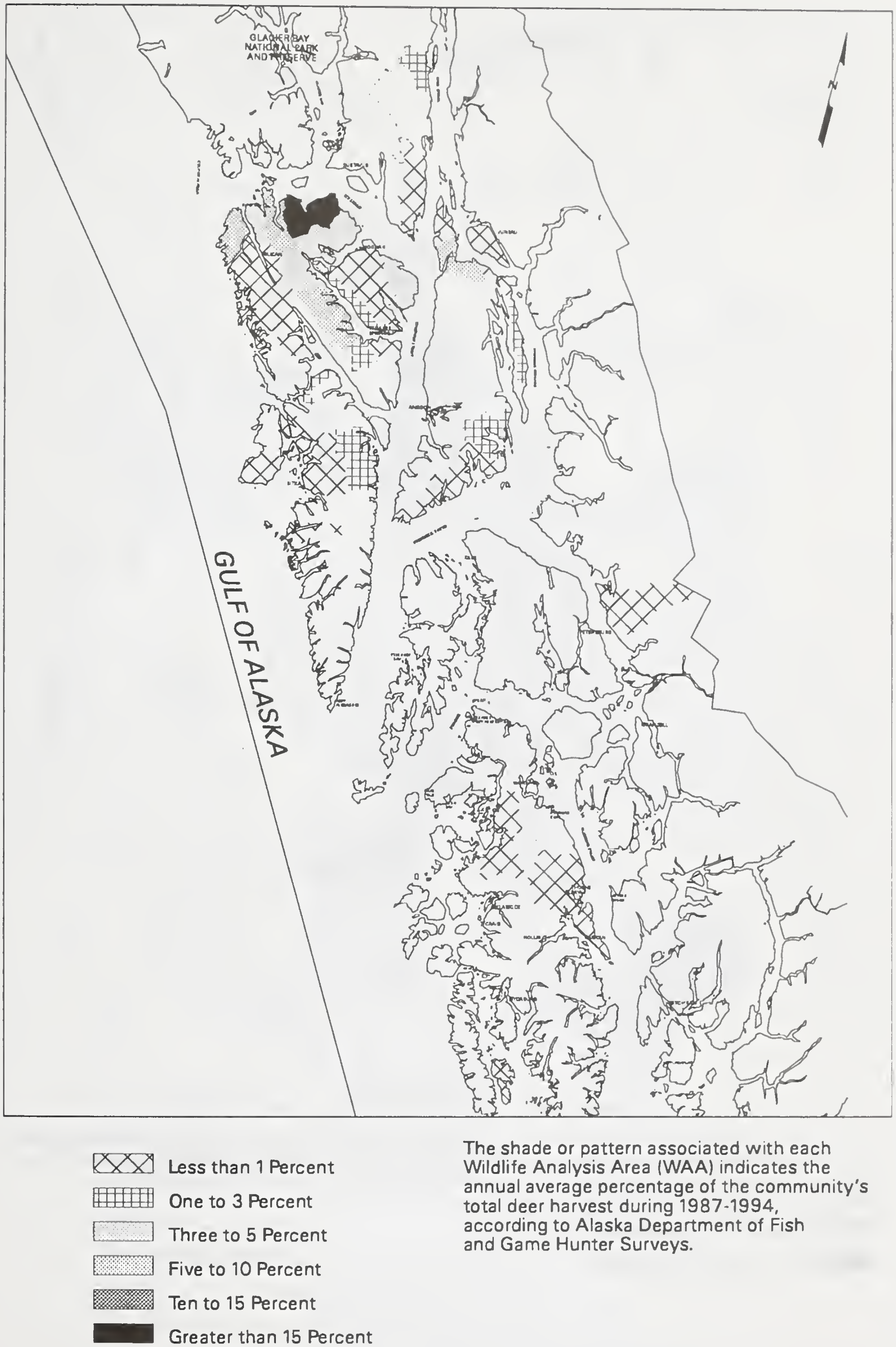
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

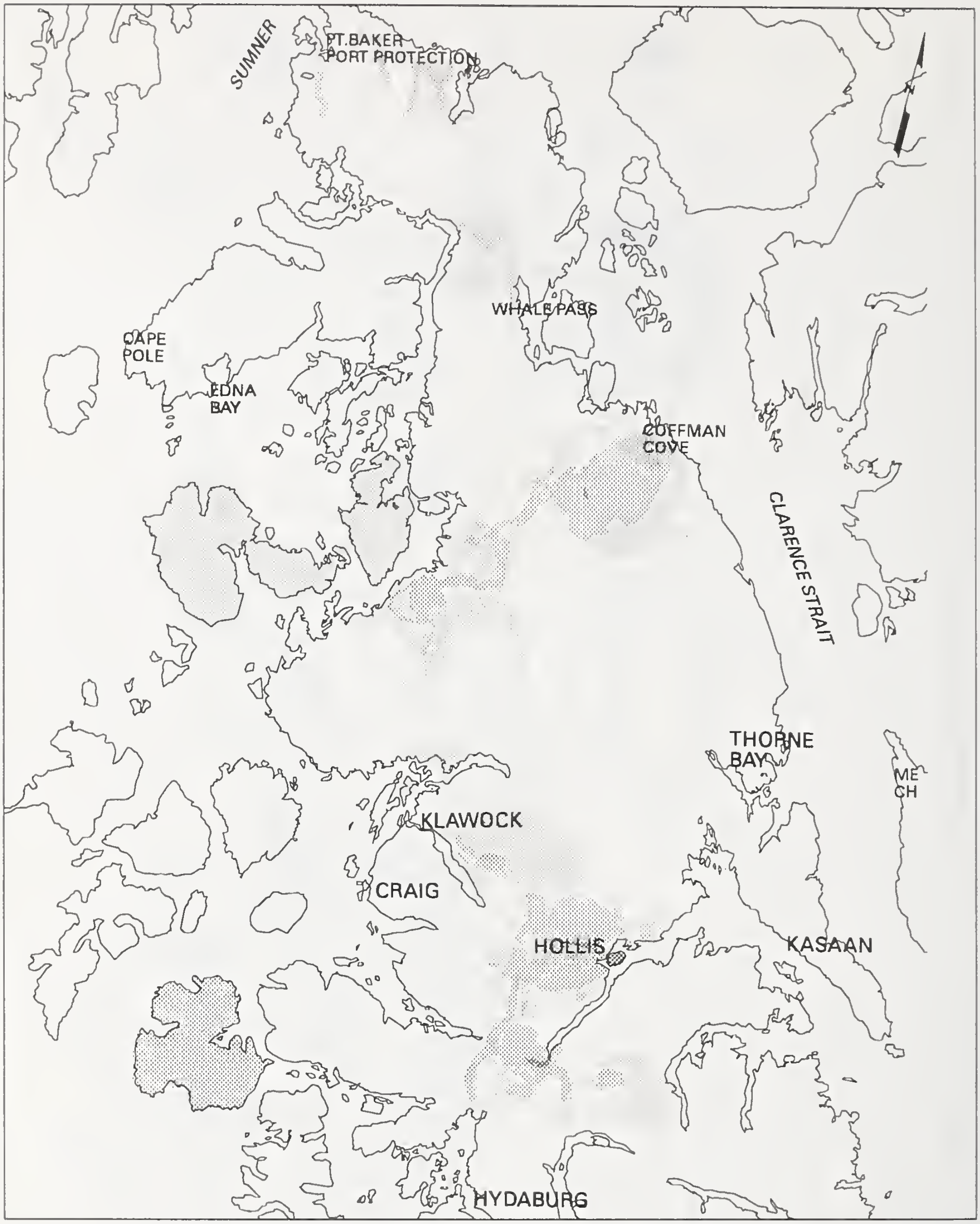
Source, TRUCS 1988

Percent of annual Haines deer harvest by WAA, 1987-1994



The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Hollis' Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

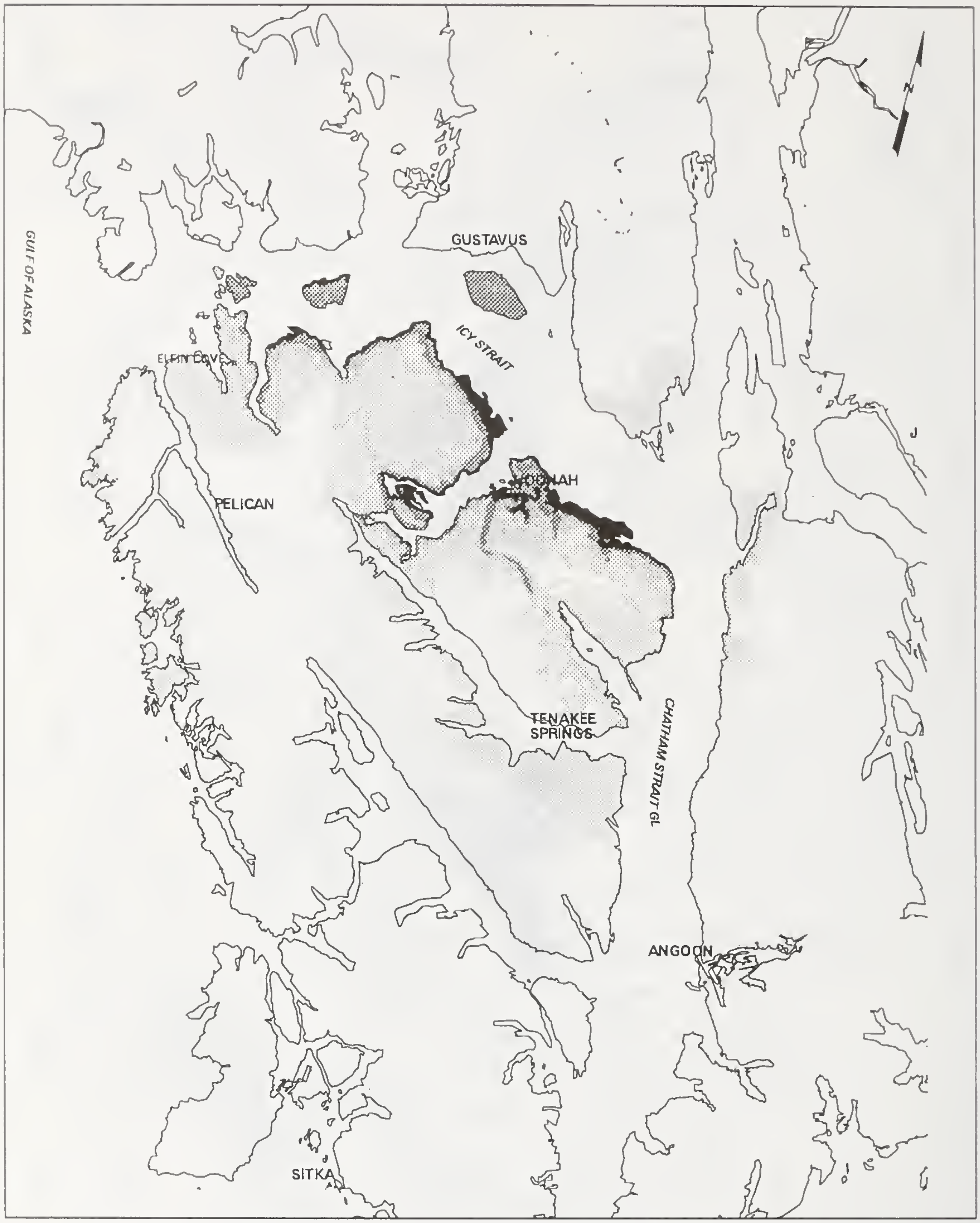
Source, TRUCS 1988

Percent of annual Hollis deer harvest by WAA, 1987-1994

- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Hoonah's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

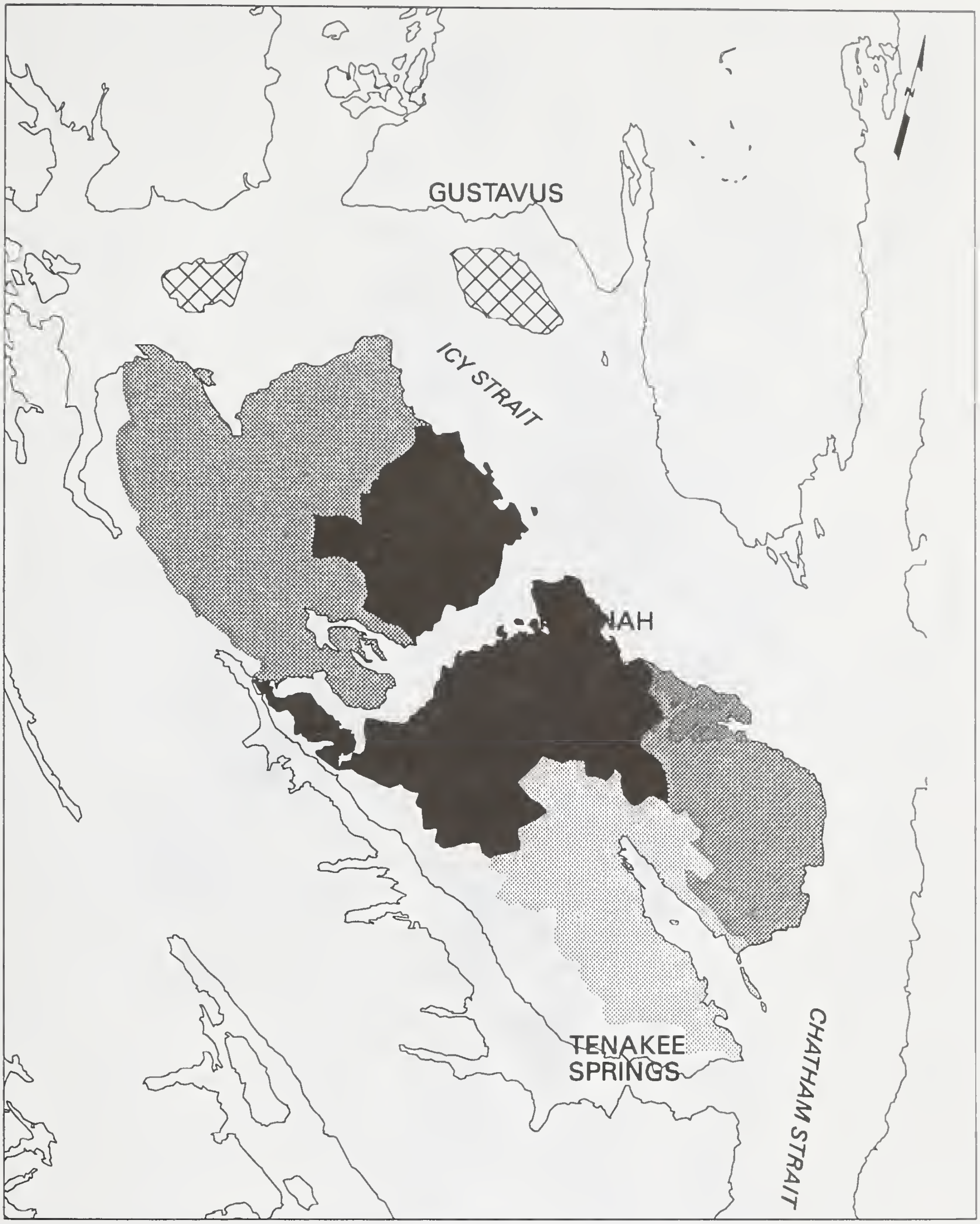
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

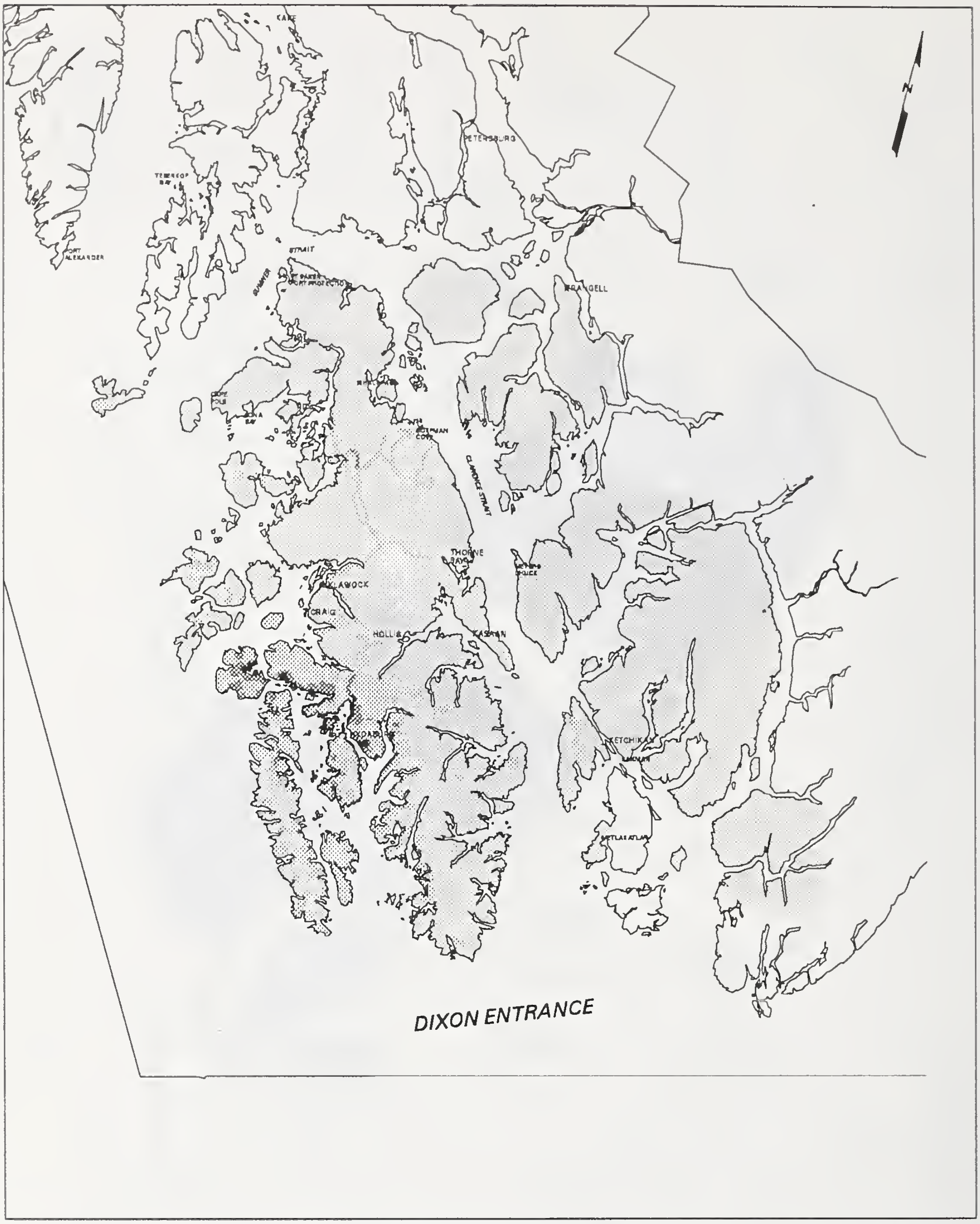
Percent of annual Hoonah deer harvest by WAA, 1987-1994



Less than 1 Percent
One to 3 Percent
Three to 5 Percent
Five to 10 Percent
Ten to 15 Percent
Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Hydaberg's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

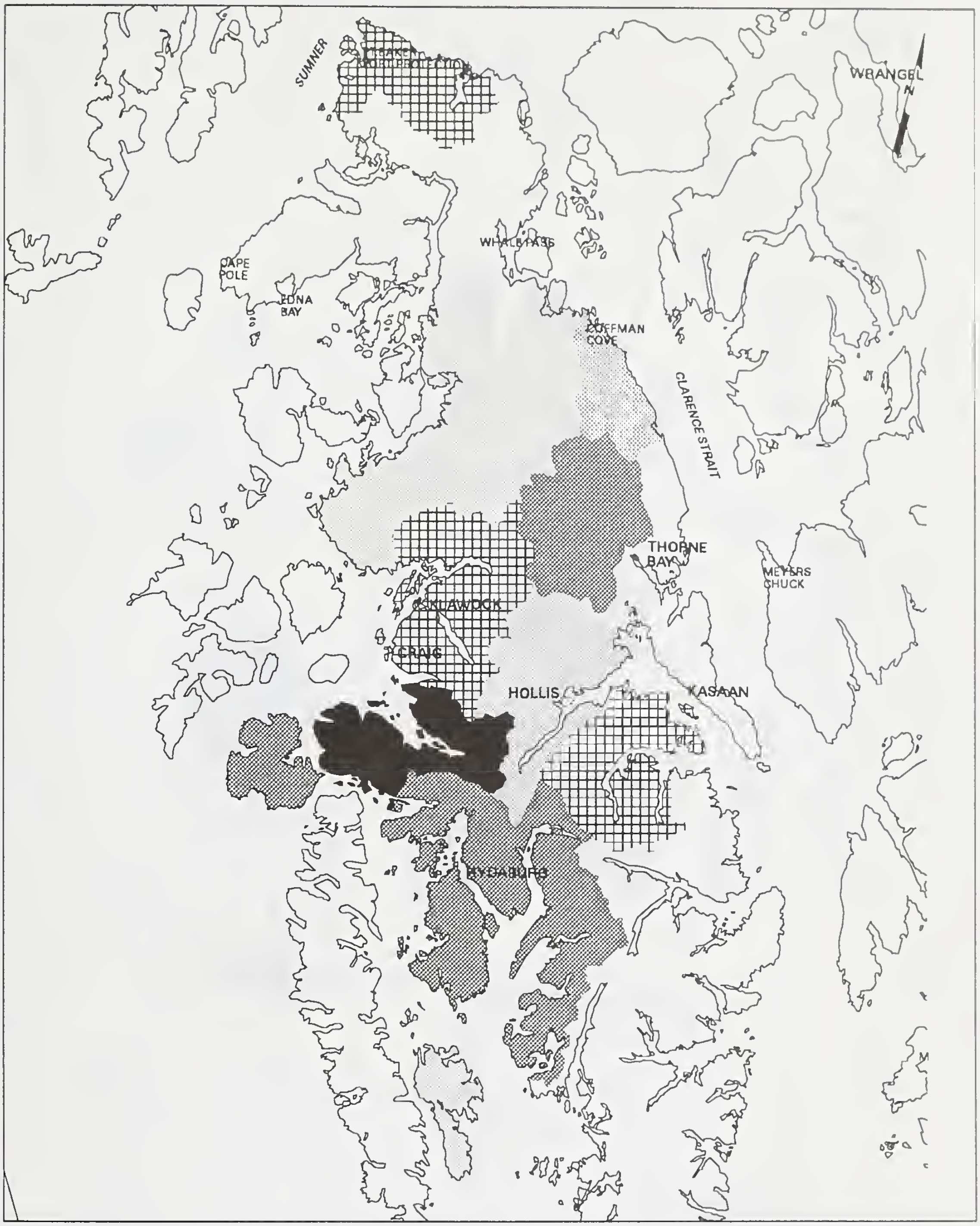
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

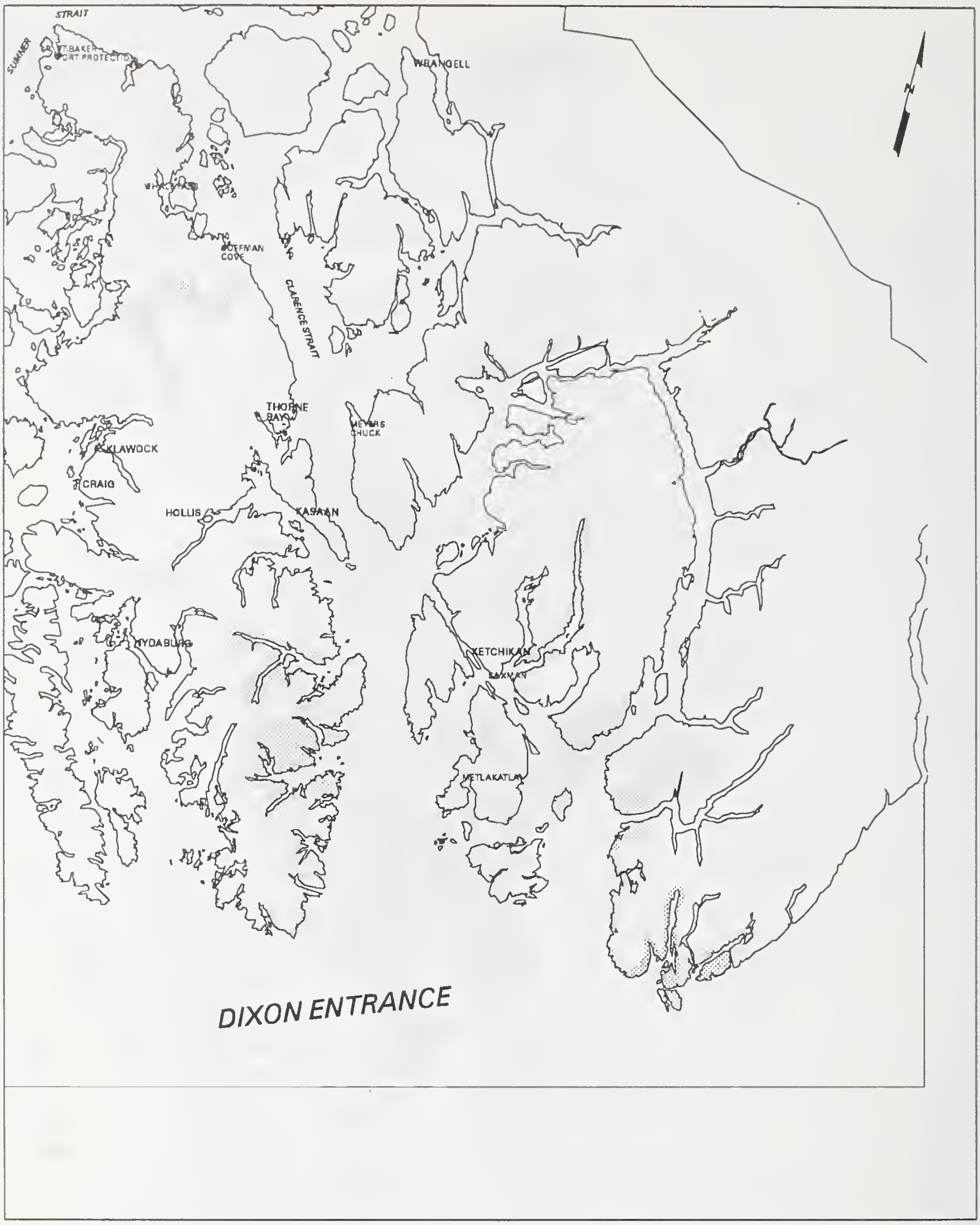
Percent of annual Hydaburg deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Hyder's Traditional Household Hunting Areas

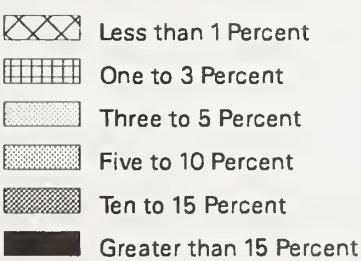


1-5 % of Households
6-15 % of Households
16-25 % of Households
> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

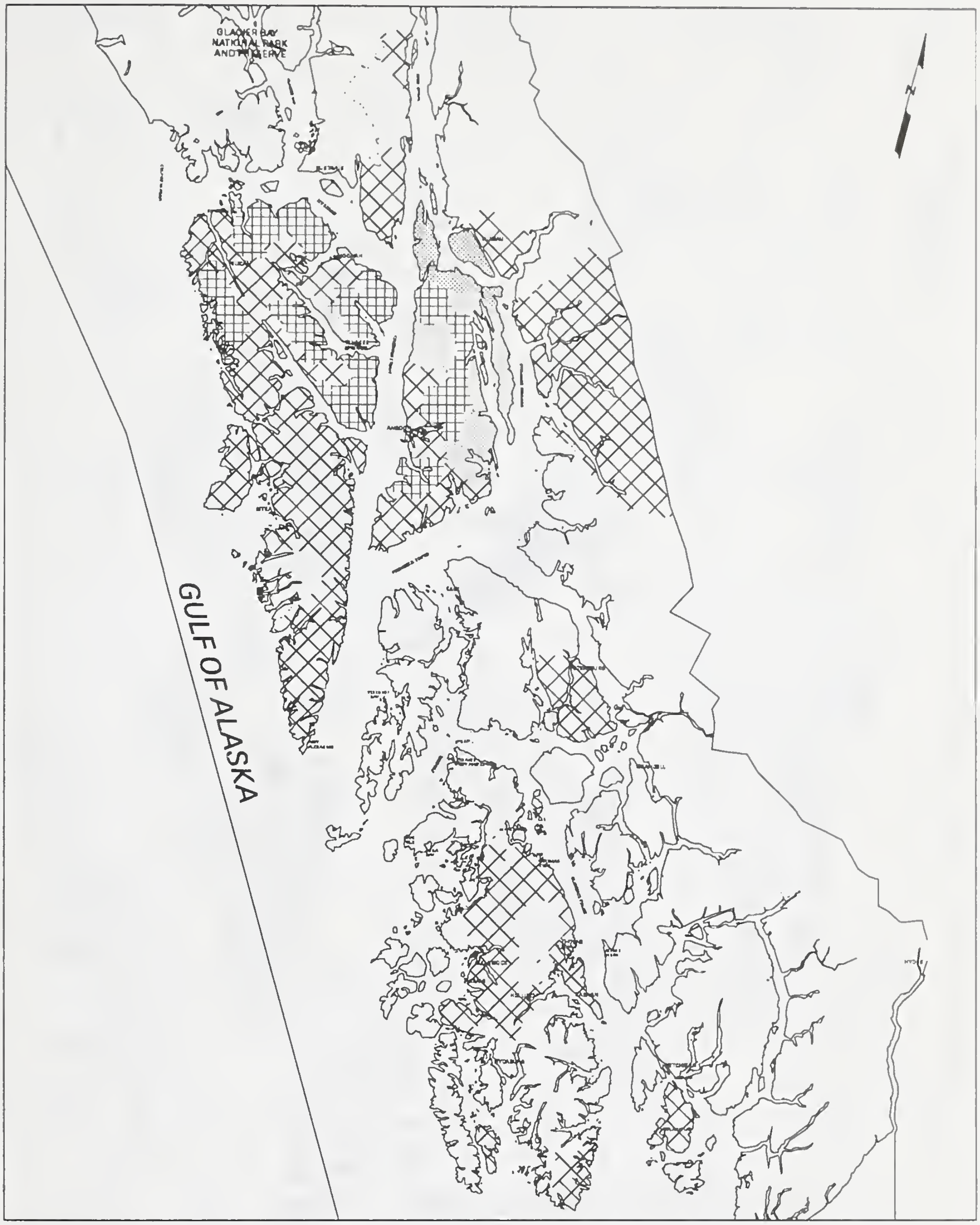
Percent of annual Hyder deer harvest by WAA, 1987-1994



The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Traditional Household Hunting Data from TRUCS not Available for Juneau

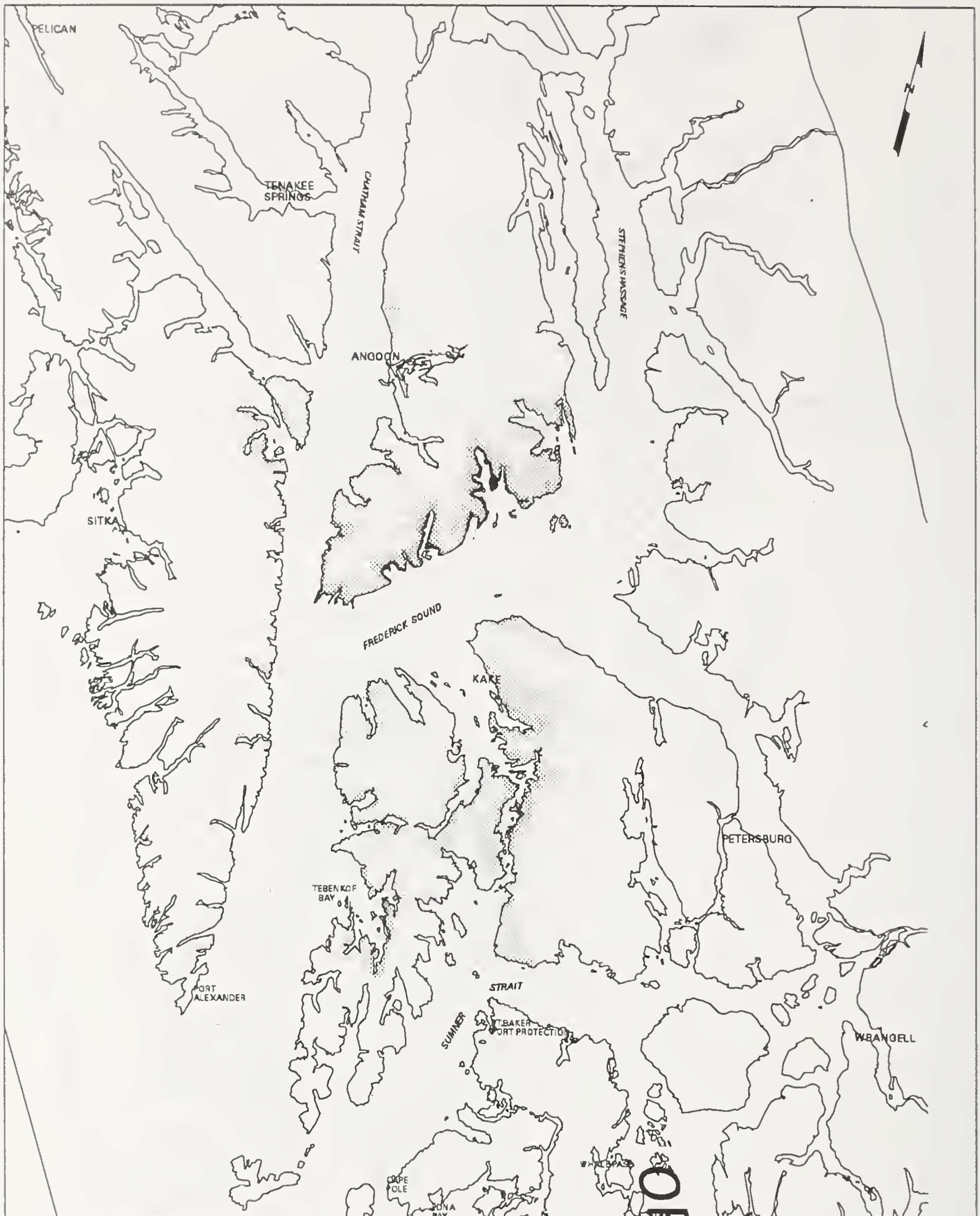
Percent of annual Juneau deer harvest by WAA, 1987-1994



Less than 1 Percent
One to 3 Percent
Three to 5 Percent
Five to 10 Percent
Ten to 15 Percent
Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Kake's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

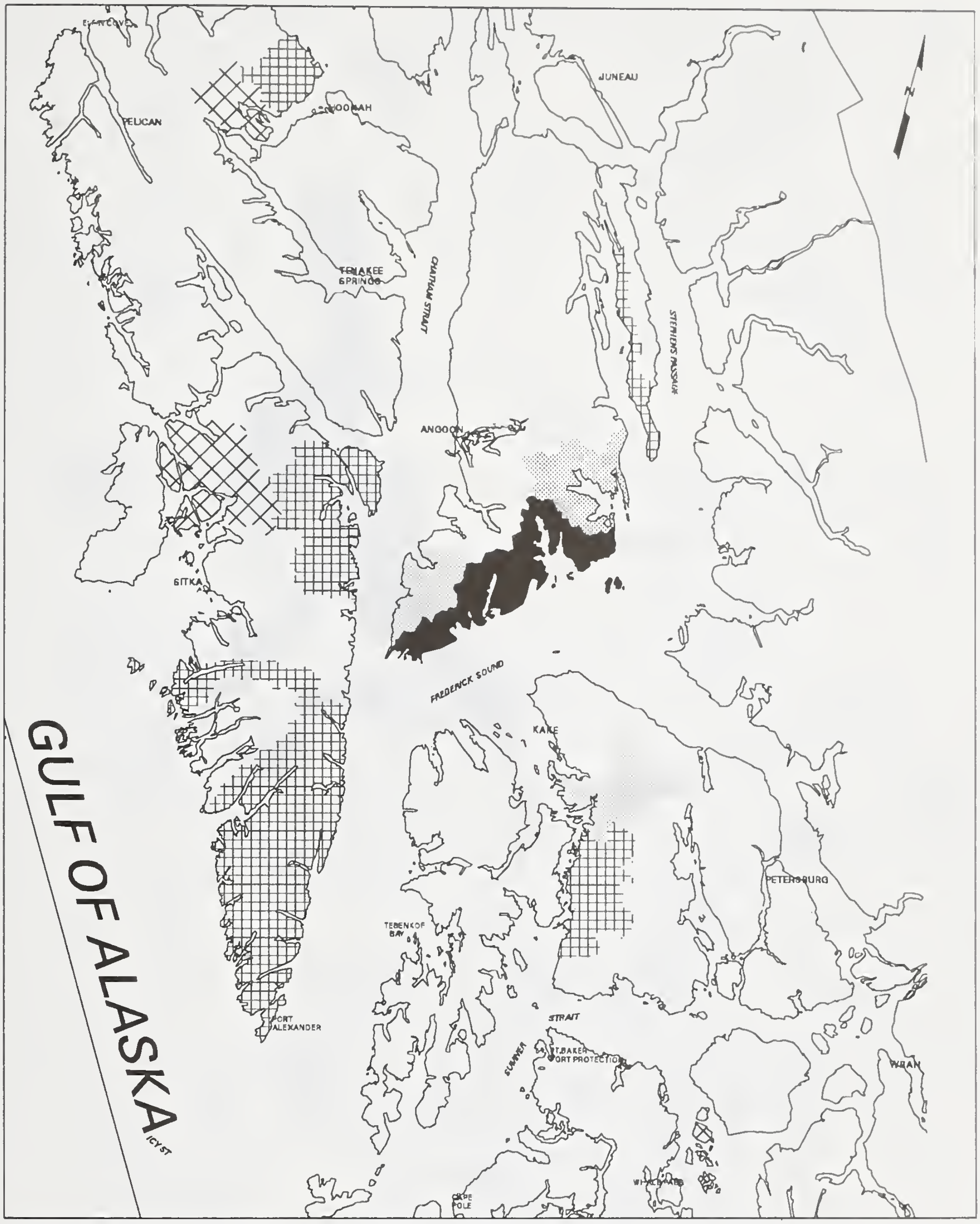
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

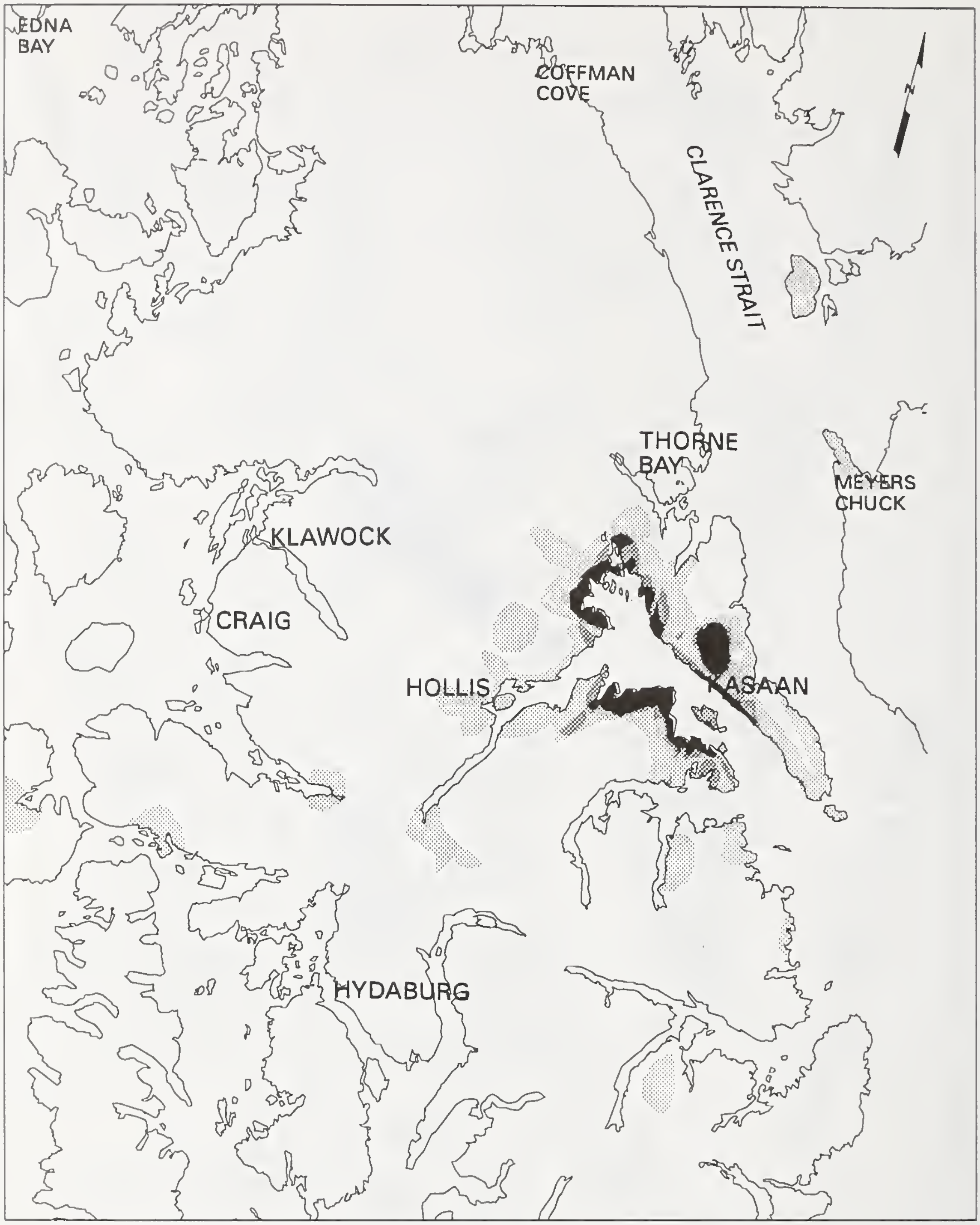
Percent of annual Kake deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Kassan's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

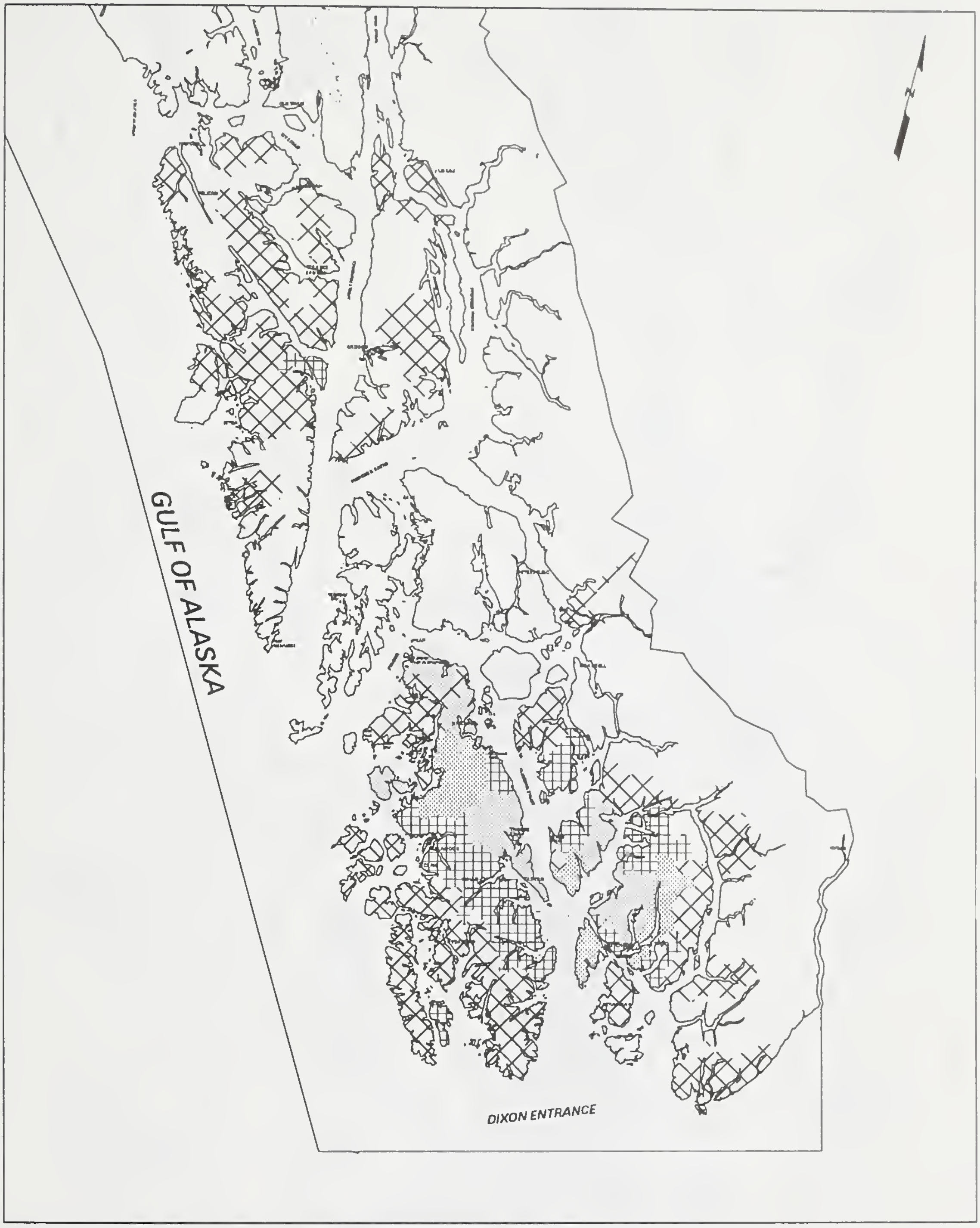
Percent of annual Kasaan deer harvest by WAA, 1987-1994

- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Traditional Household Hunting Data from TRUCS not Available for Ketchikan

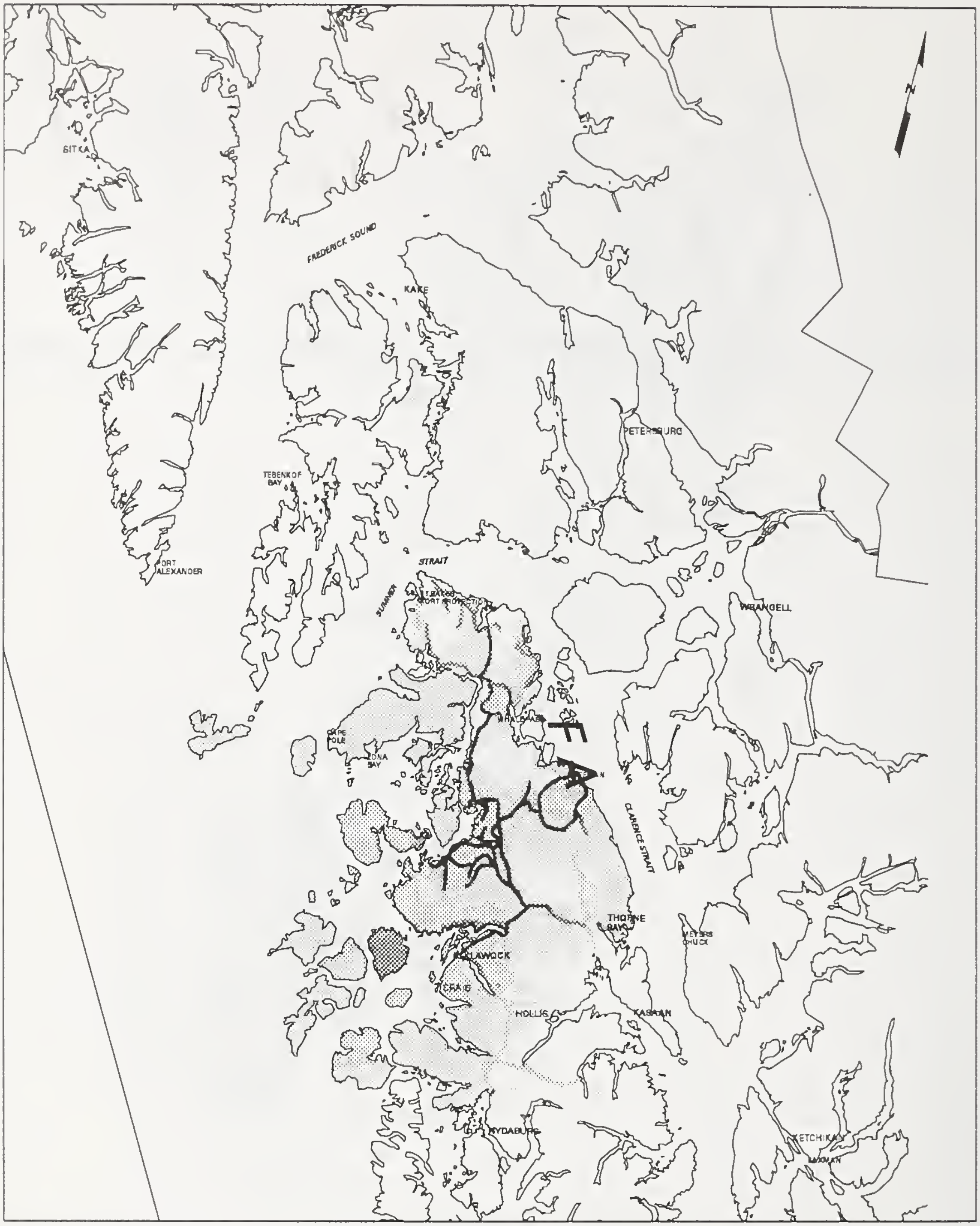
Percent of annual Ketchikan deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Klawock's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

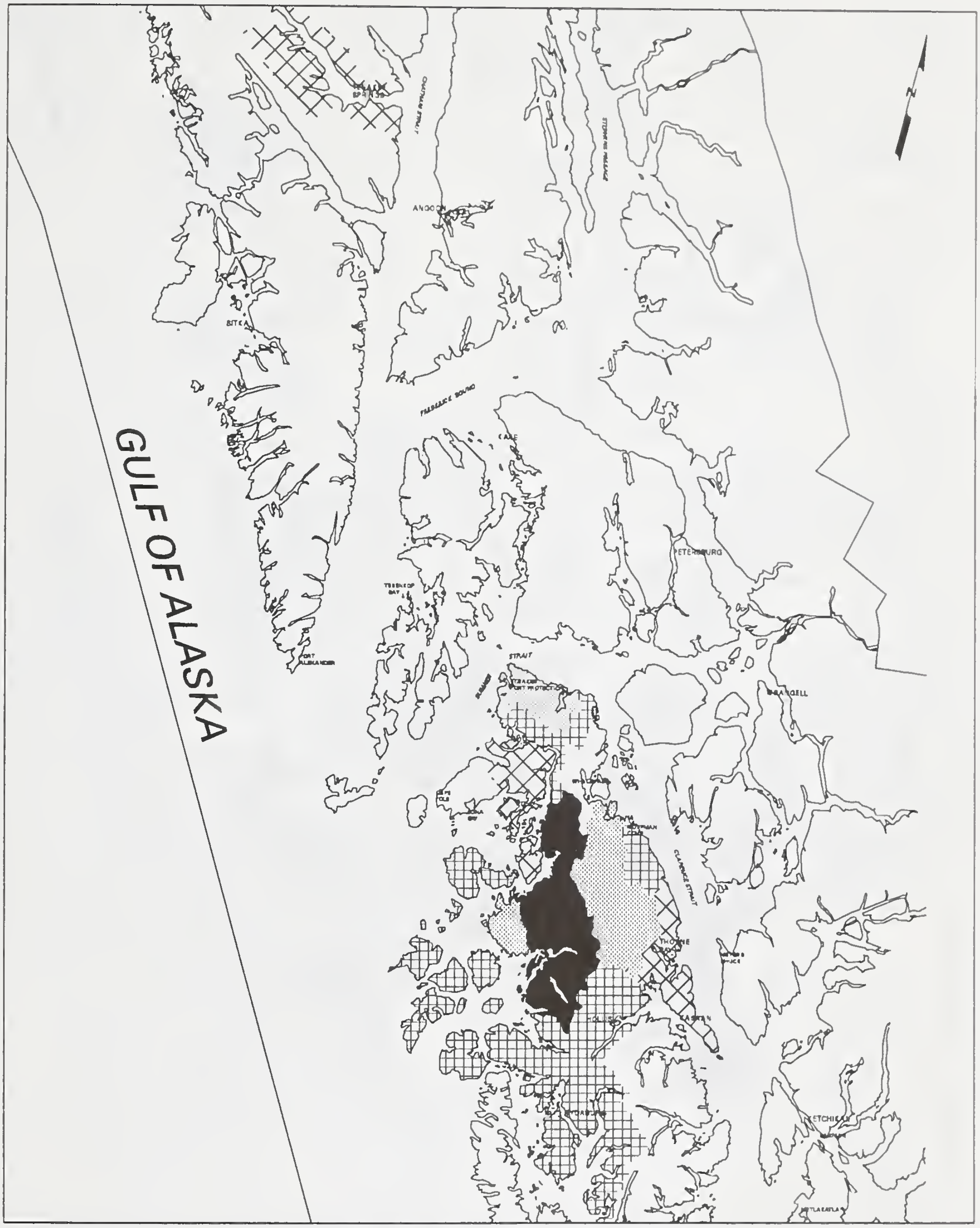
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

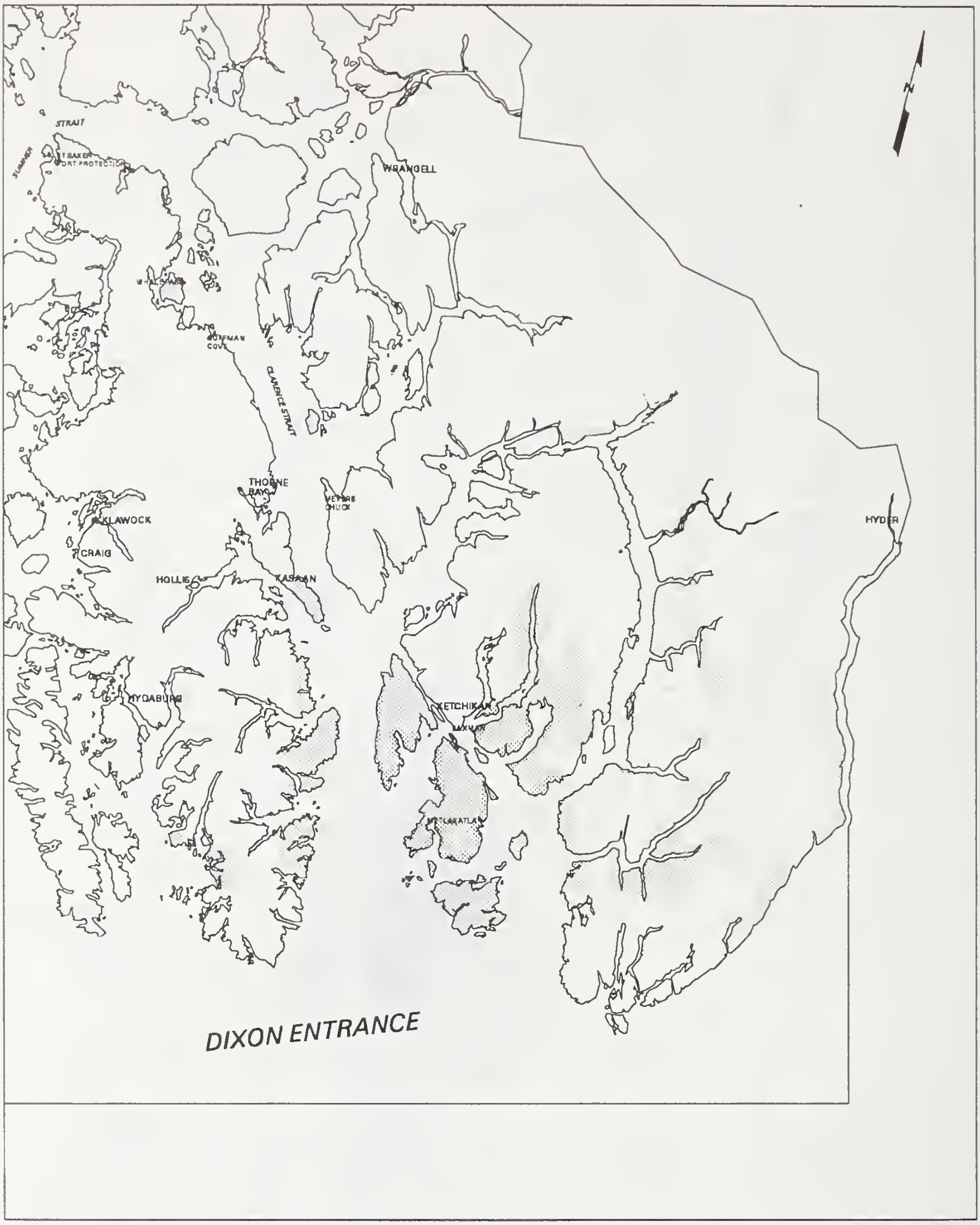
Percent of annual Klawock deer harvest by WAA, 1987-1994



Less than 1 Percent
One to 3 Percent
Three to 5 Percent
Five to 10 Percent
Ten to 15 Percent
Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Metlakatla's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

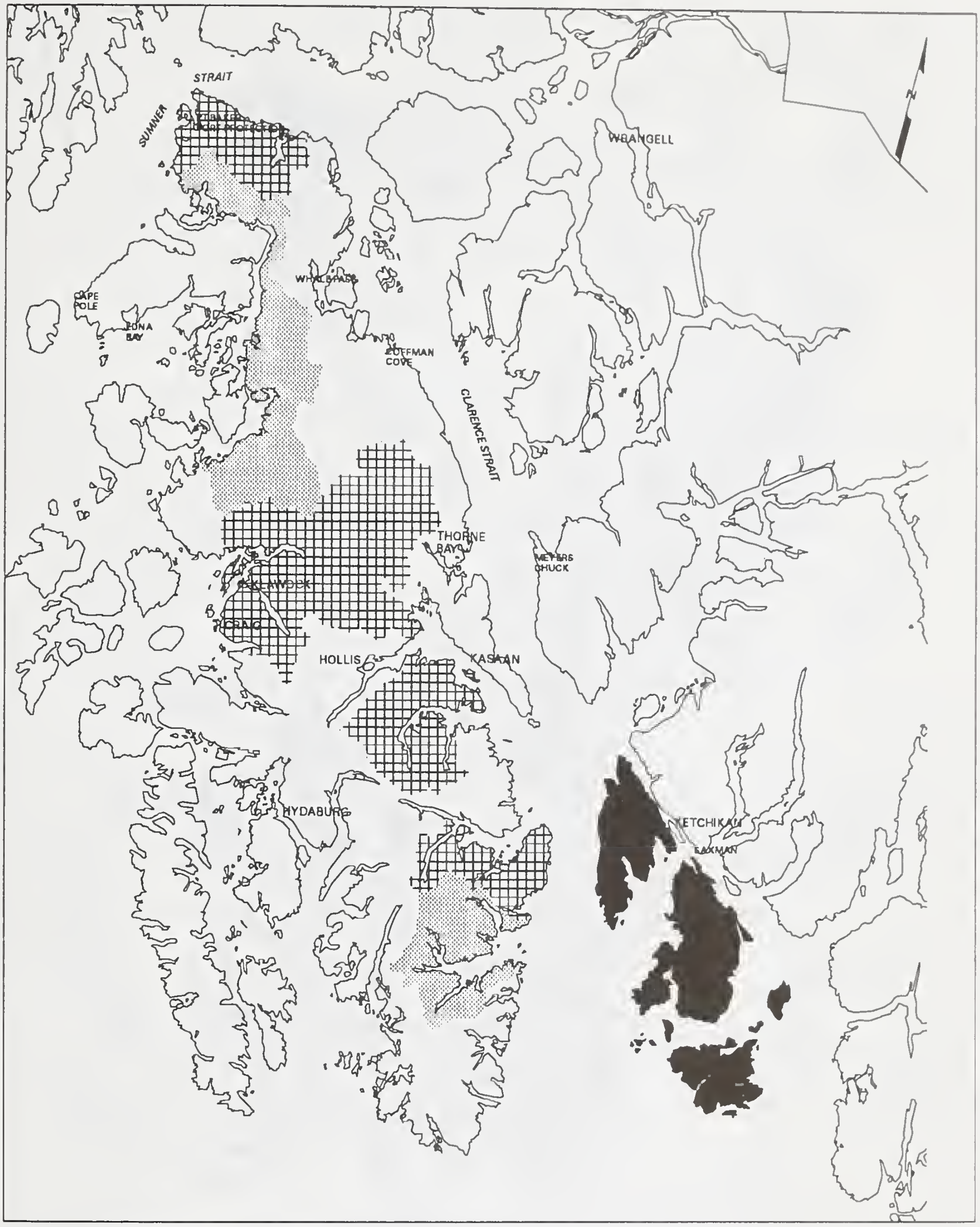
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

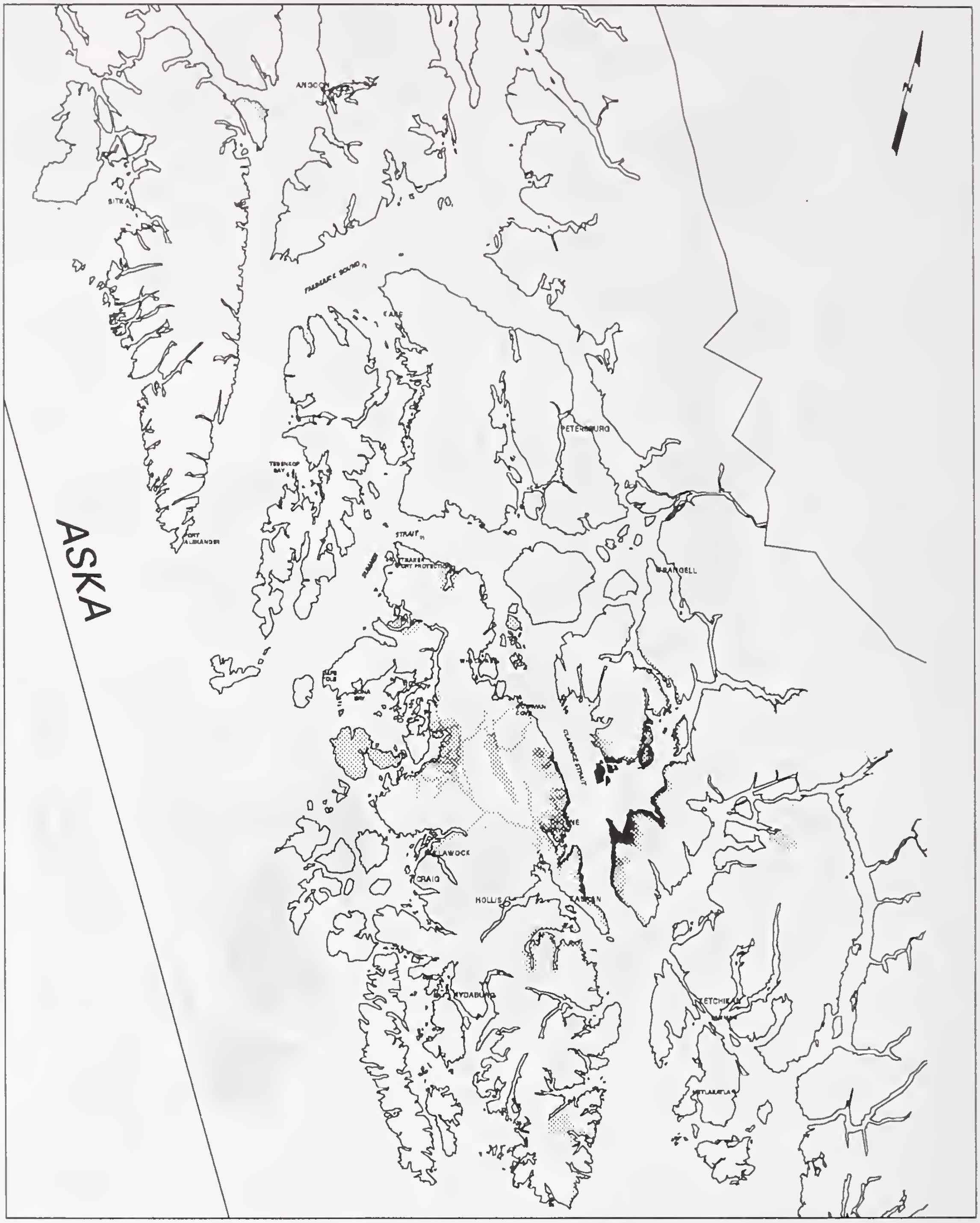
Percent of annual Metlakatla deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Meyers Chuck's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

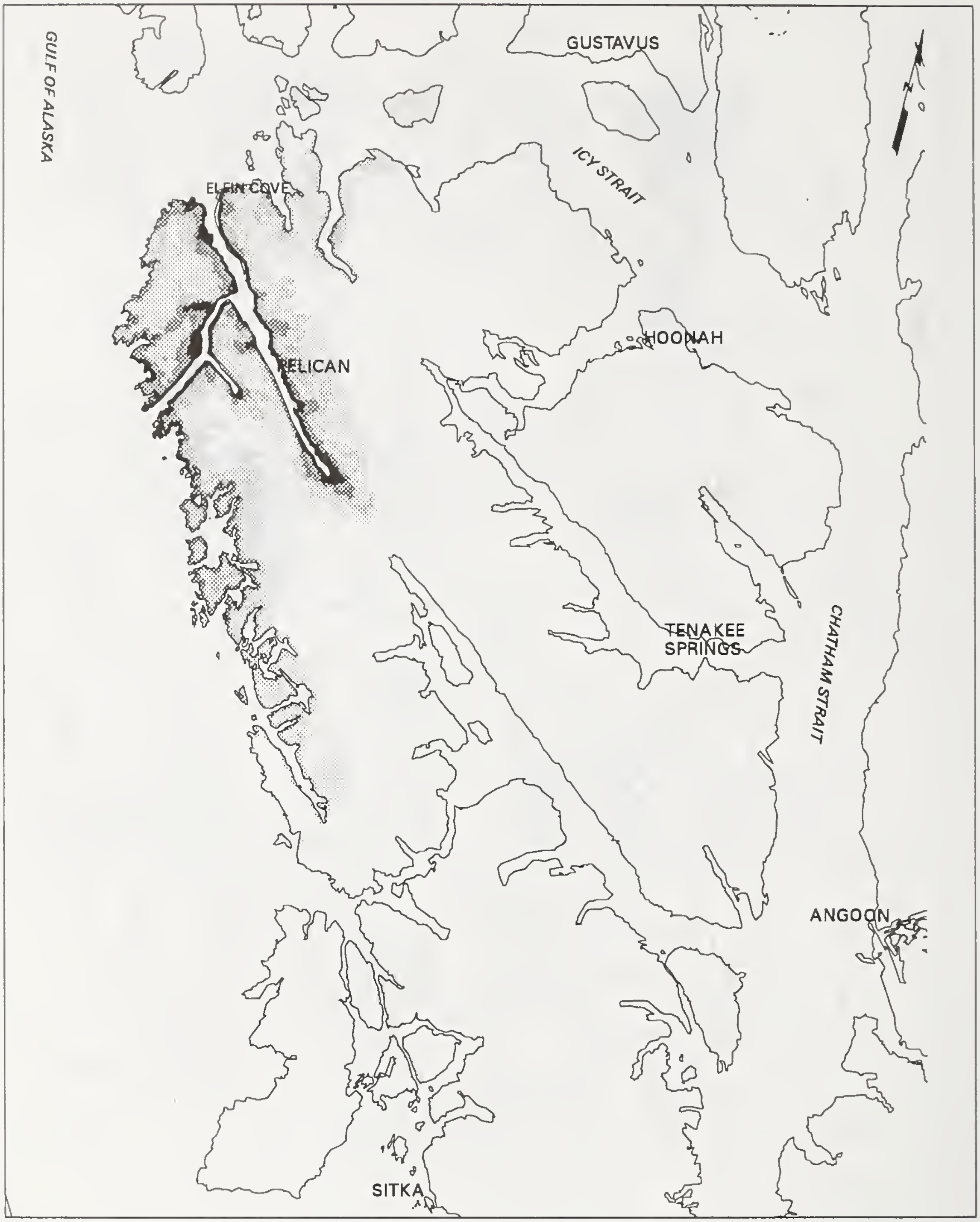
Source, TRUCS 1988

Percent of annual Meyers Chuck deer harvest by WAA, 1987-1994

- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Pelican's Traditional Household Hunting Areas

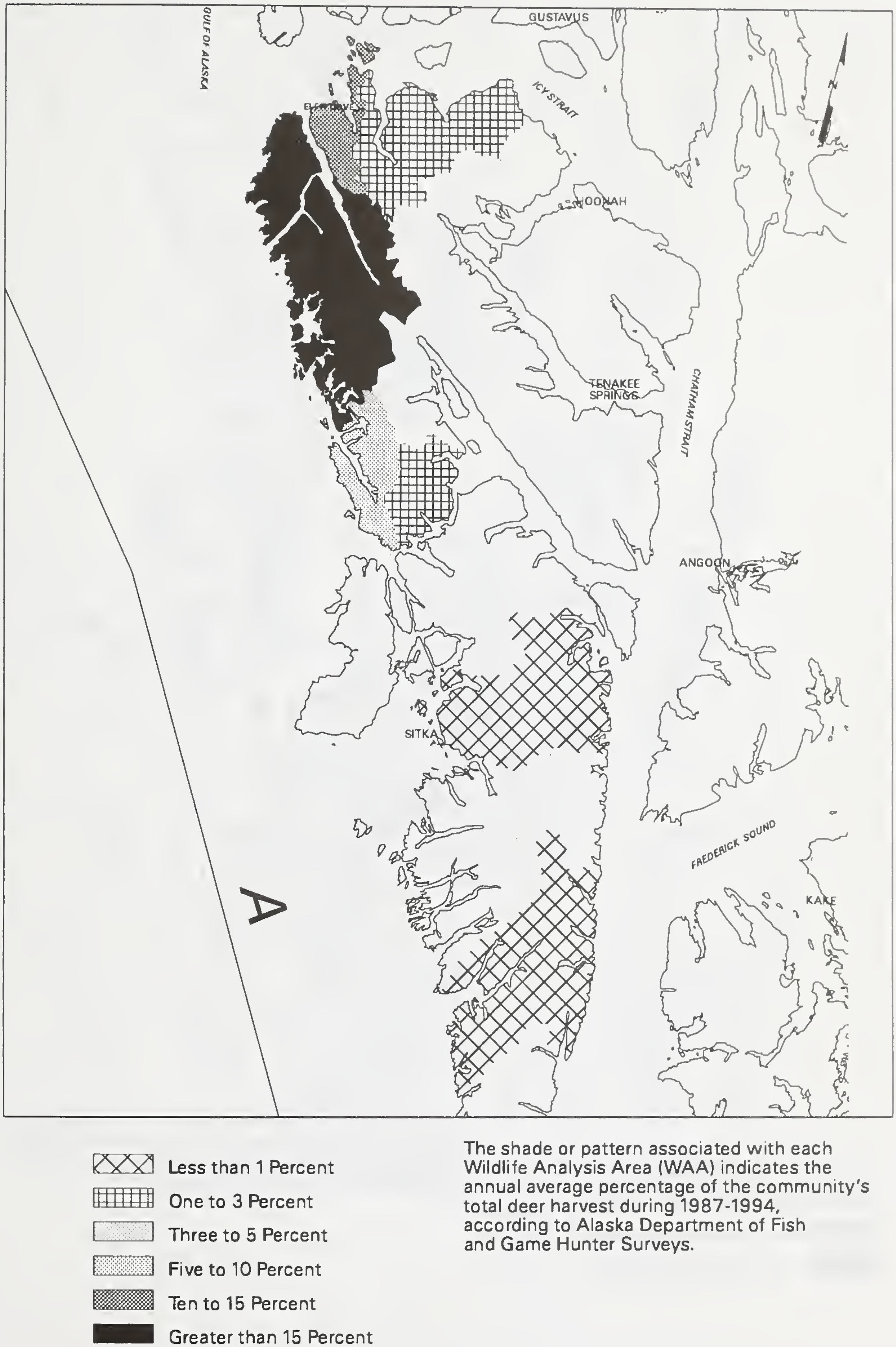


	1-5 % of Households
	6-15 % of Households
	16-25 % of Households
	> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

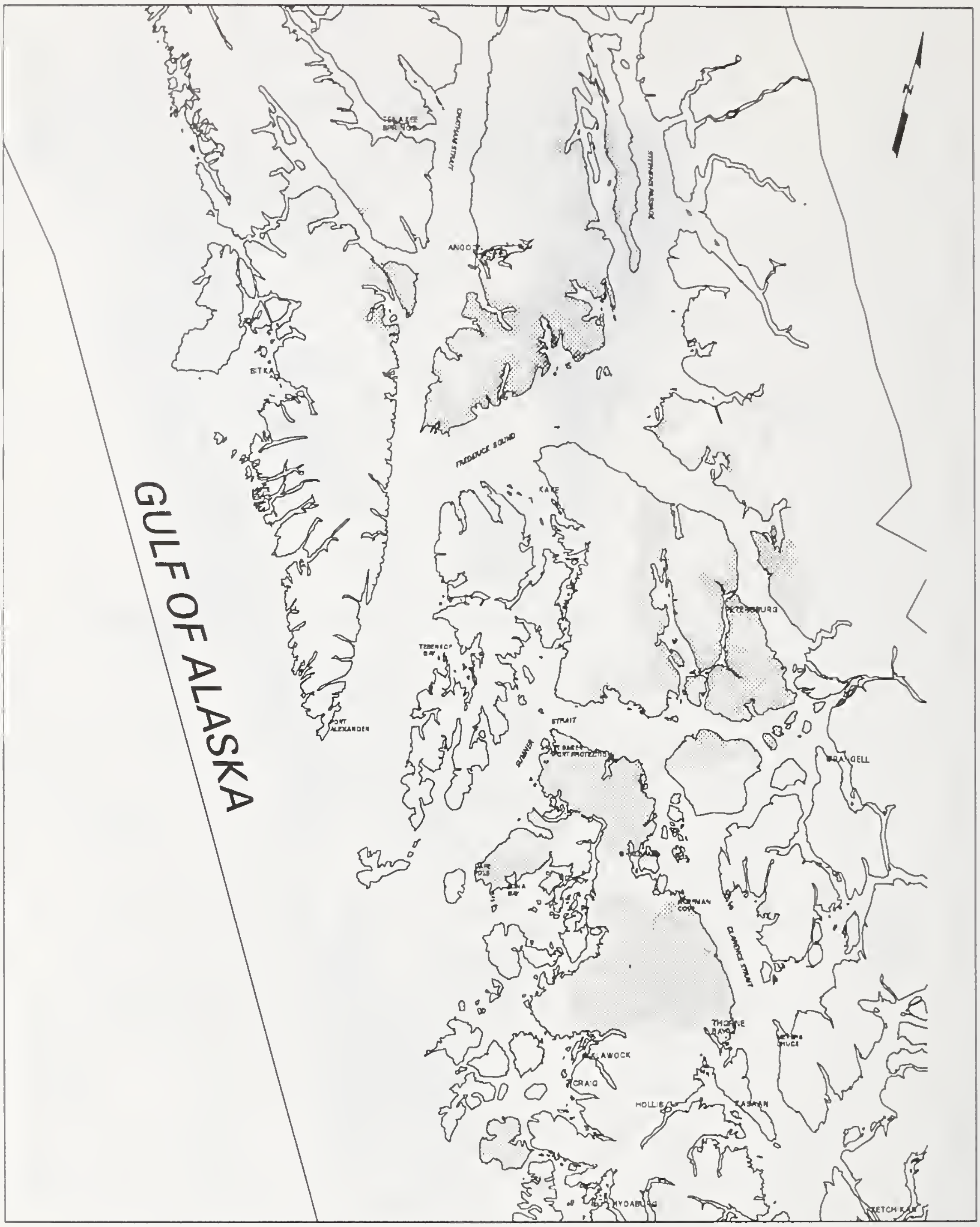
Source, TRUCS 1988

Percent of annual Pelican deer harvest by WAA, 1987-1994



The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Petersburg's Traditional Household Hunting Areas

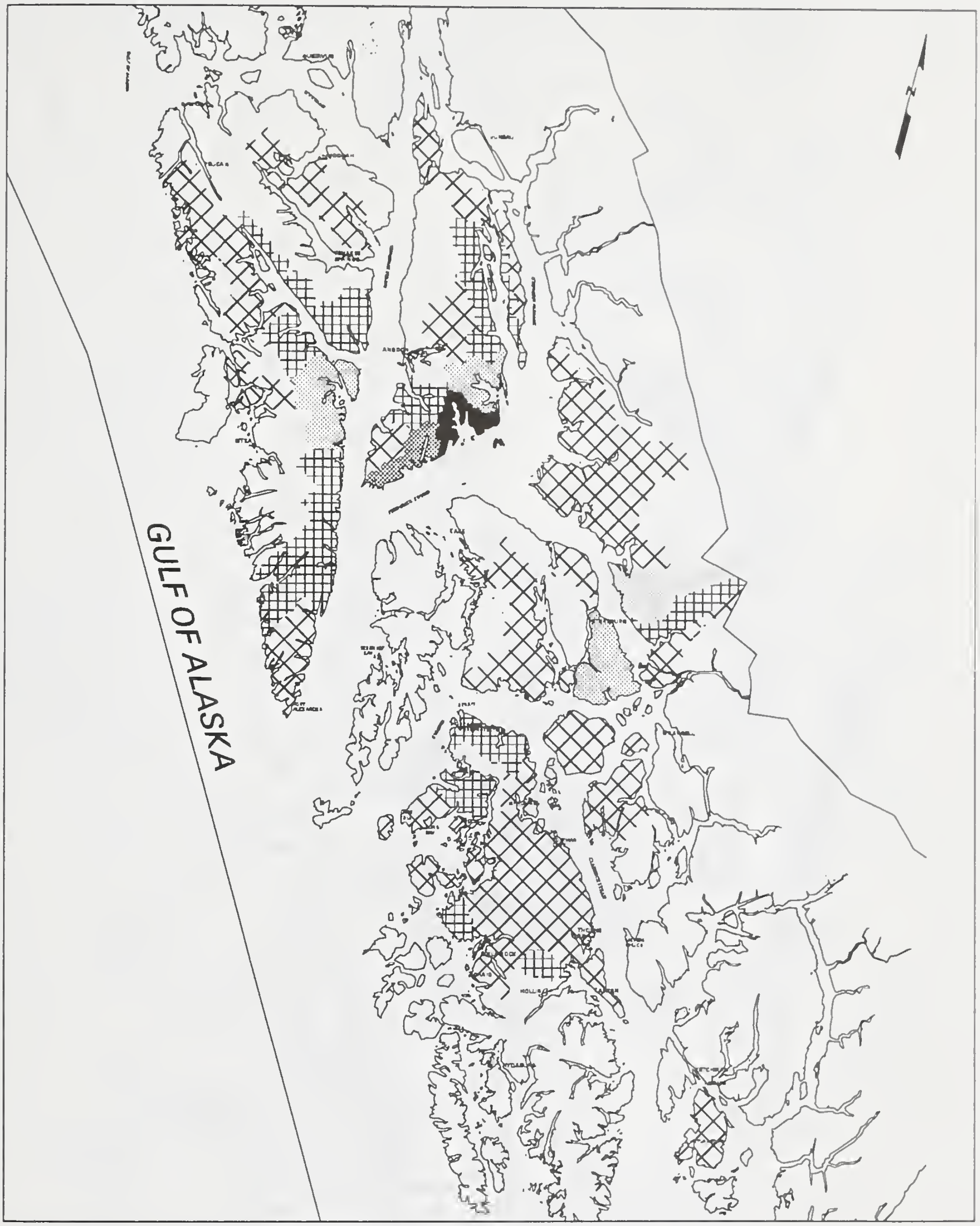


(lightest shading)	1-5 % of Households
(light stipple)	6-15 % of Households
(dense stipple)	16-25 % of Households
(solid black)	> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

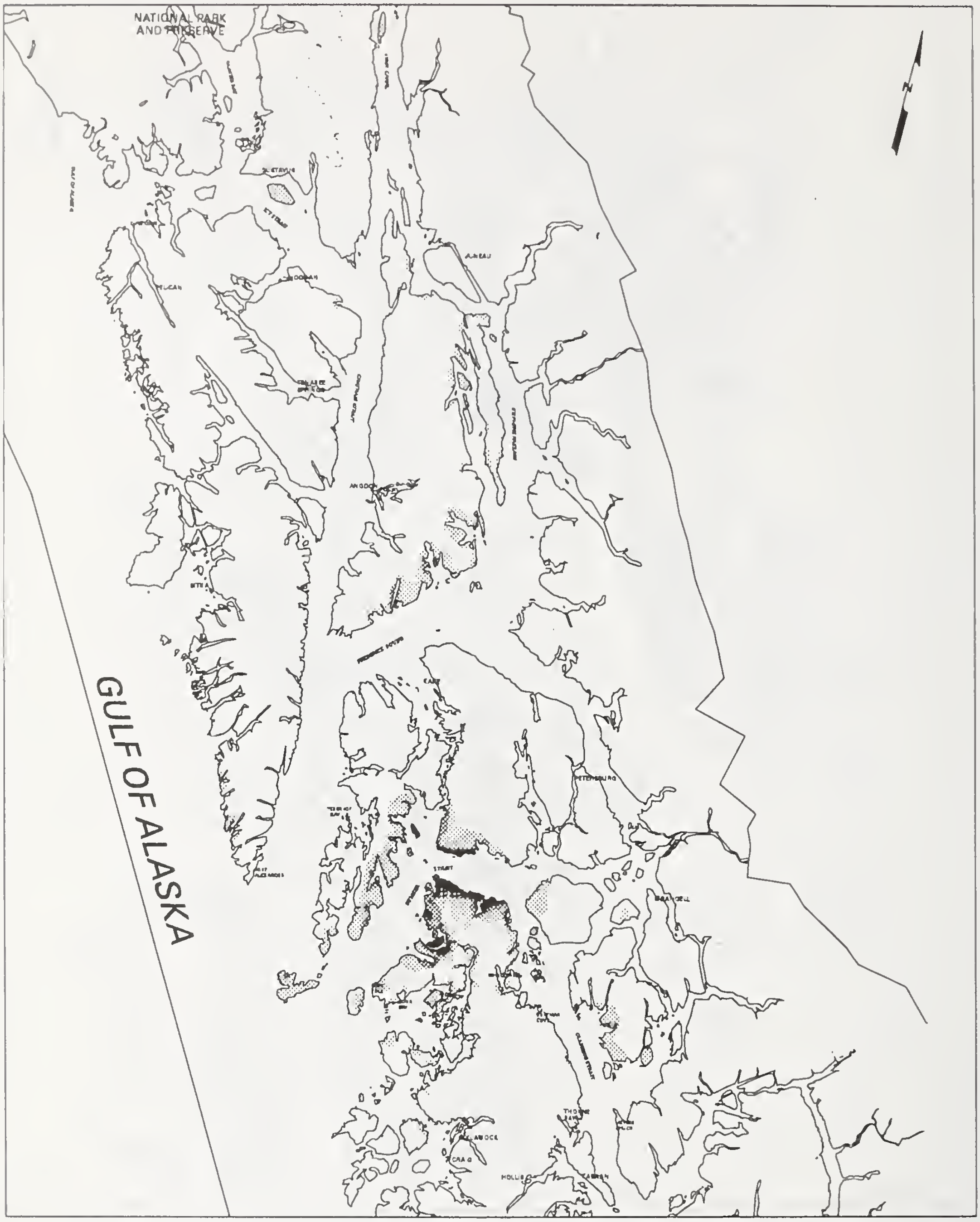
Percent of annual Petersburg deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Point Baker's Traditional Household Hunting Areas

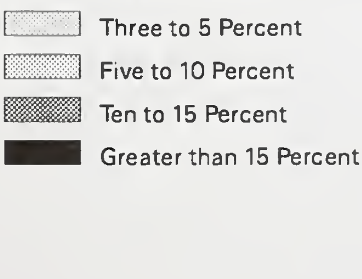


1-5 % of Households
6-15 % of Households
16-25 % of Households
> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

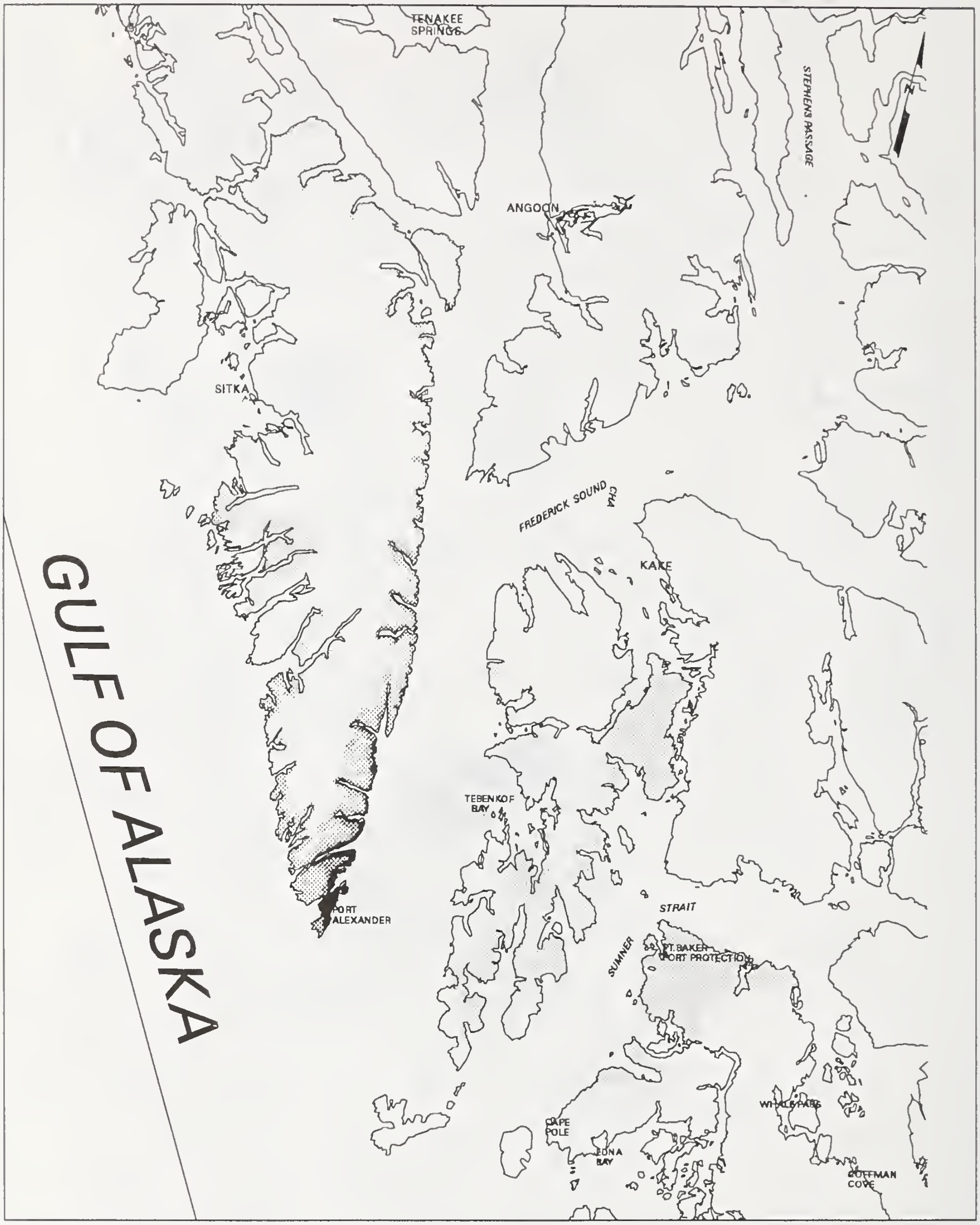
Source, TRUCS 1988

Percent of annual Point Baker deer harvest by WAA, 1987-1994



The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Port Alexander's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

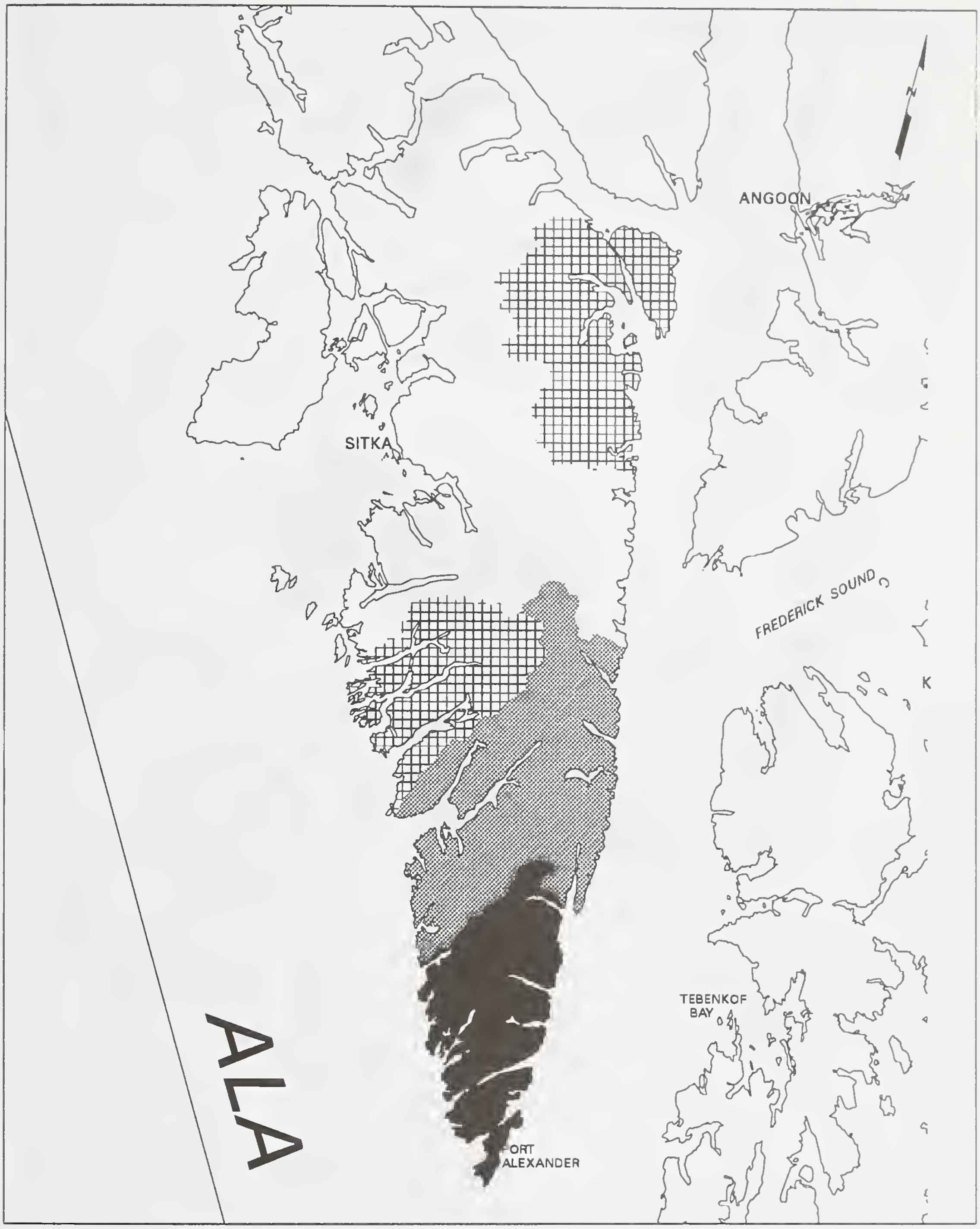
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

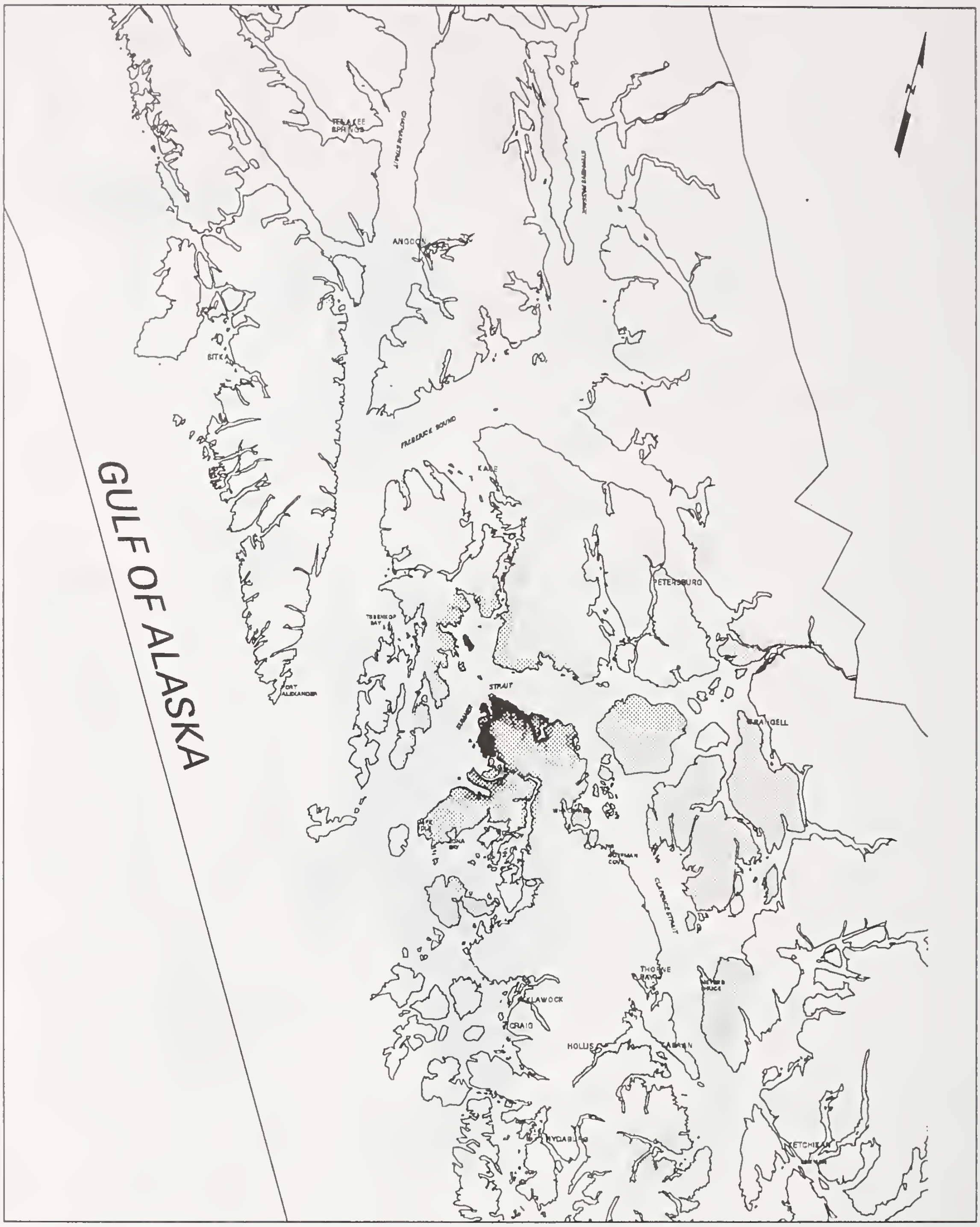
Percent of annual Port Alexander deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Port Protection's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

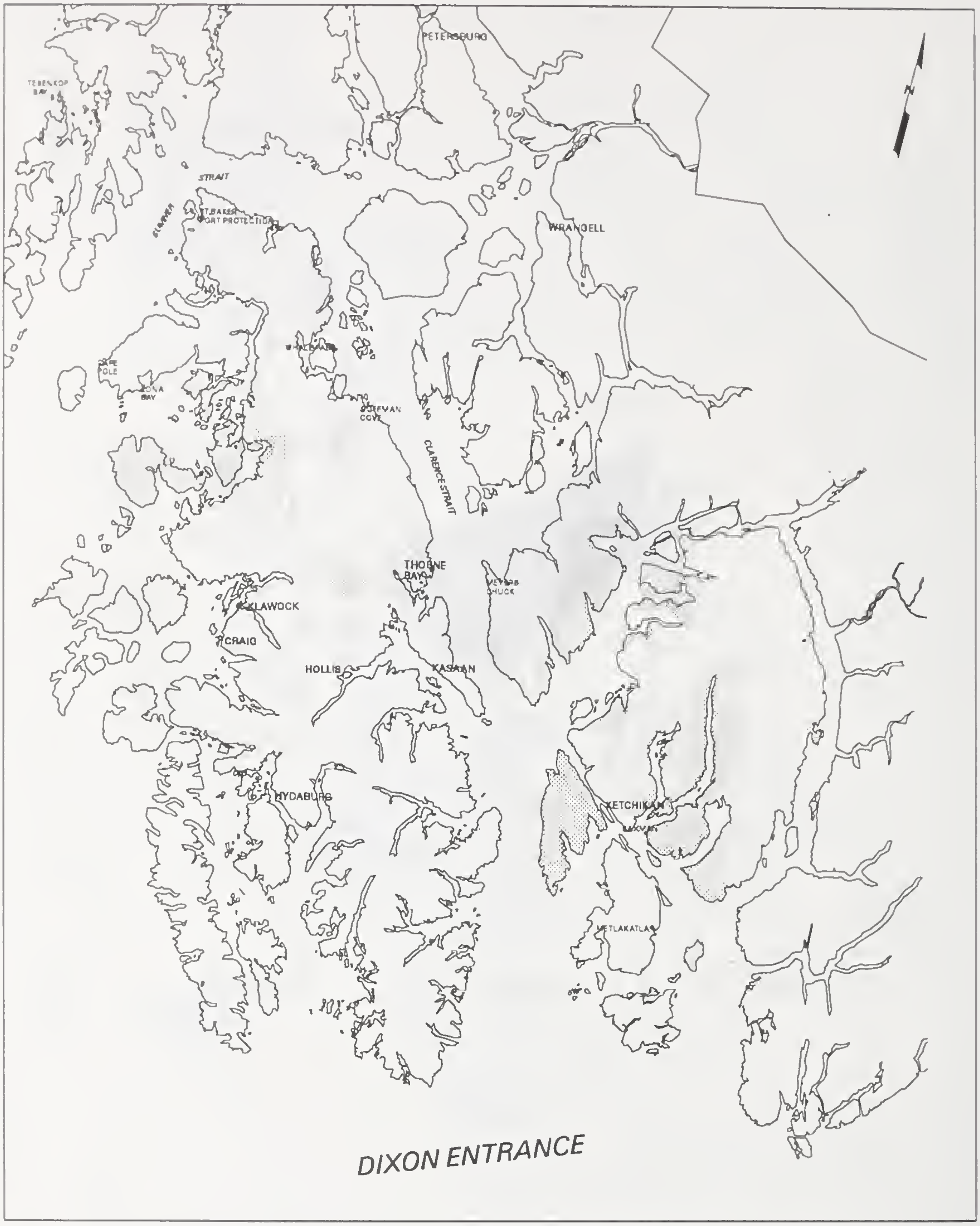
Source, TRUCS 1988

Percent of annual Port Protection deer harvest by WAA, 1987-1994

- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Saxman's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

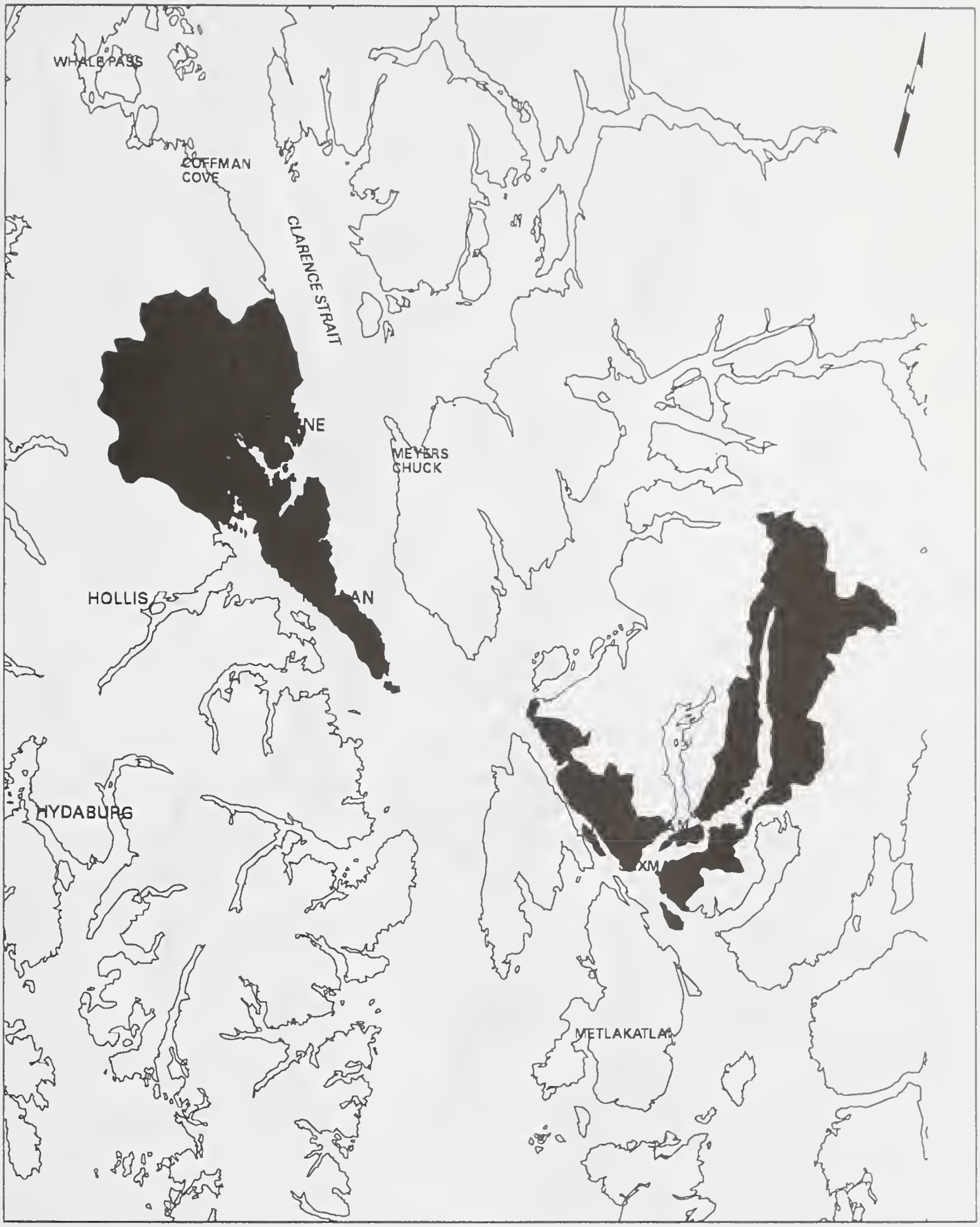
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

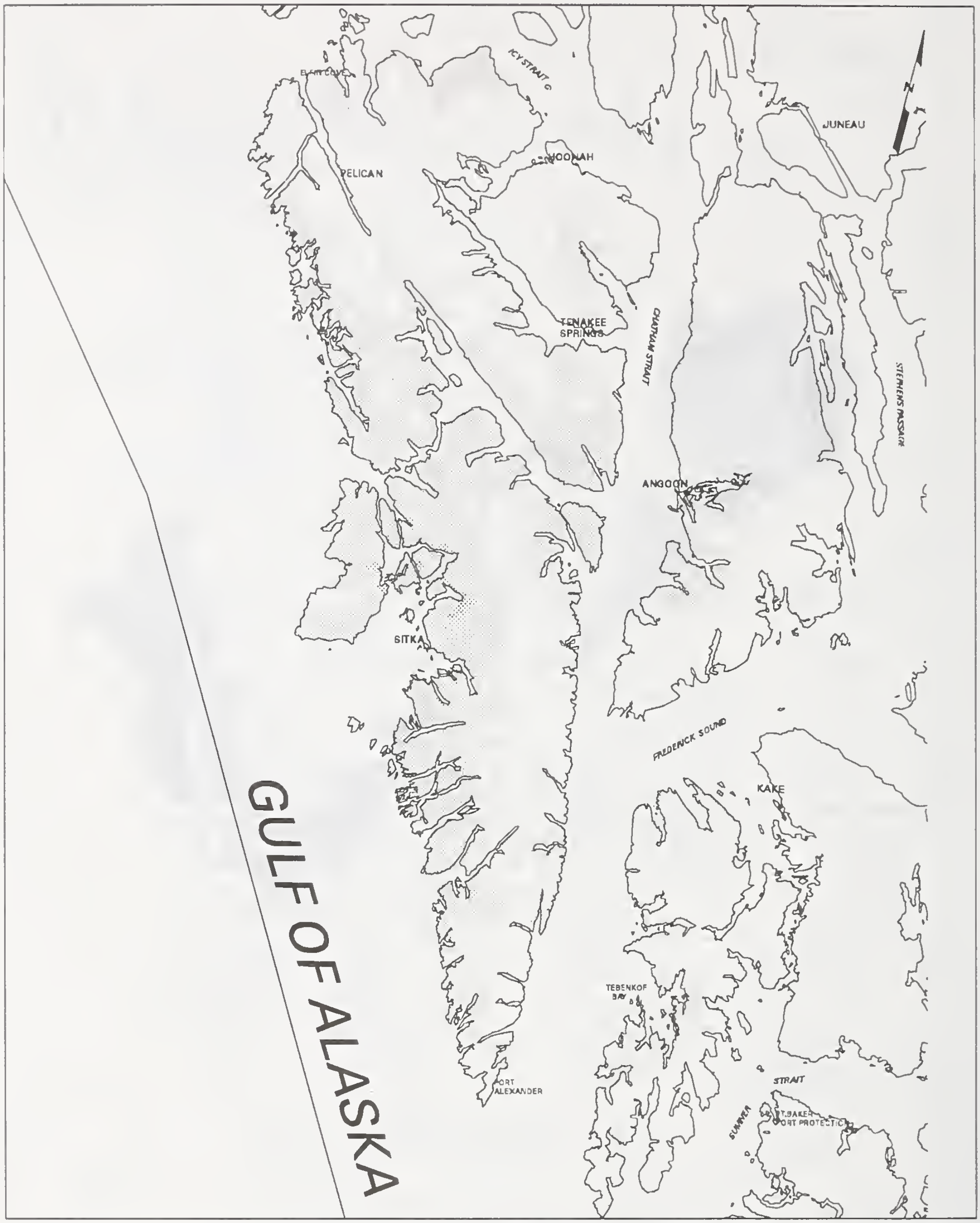
Percent of annual Saxman deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Sitka's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

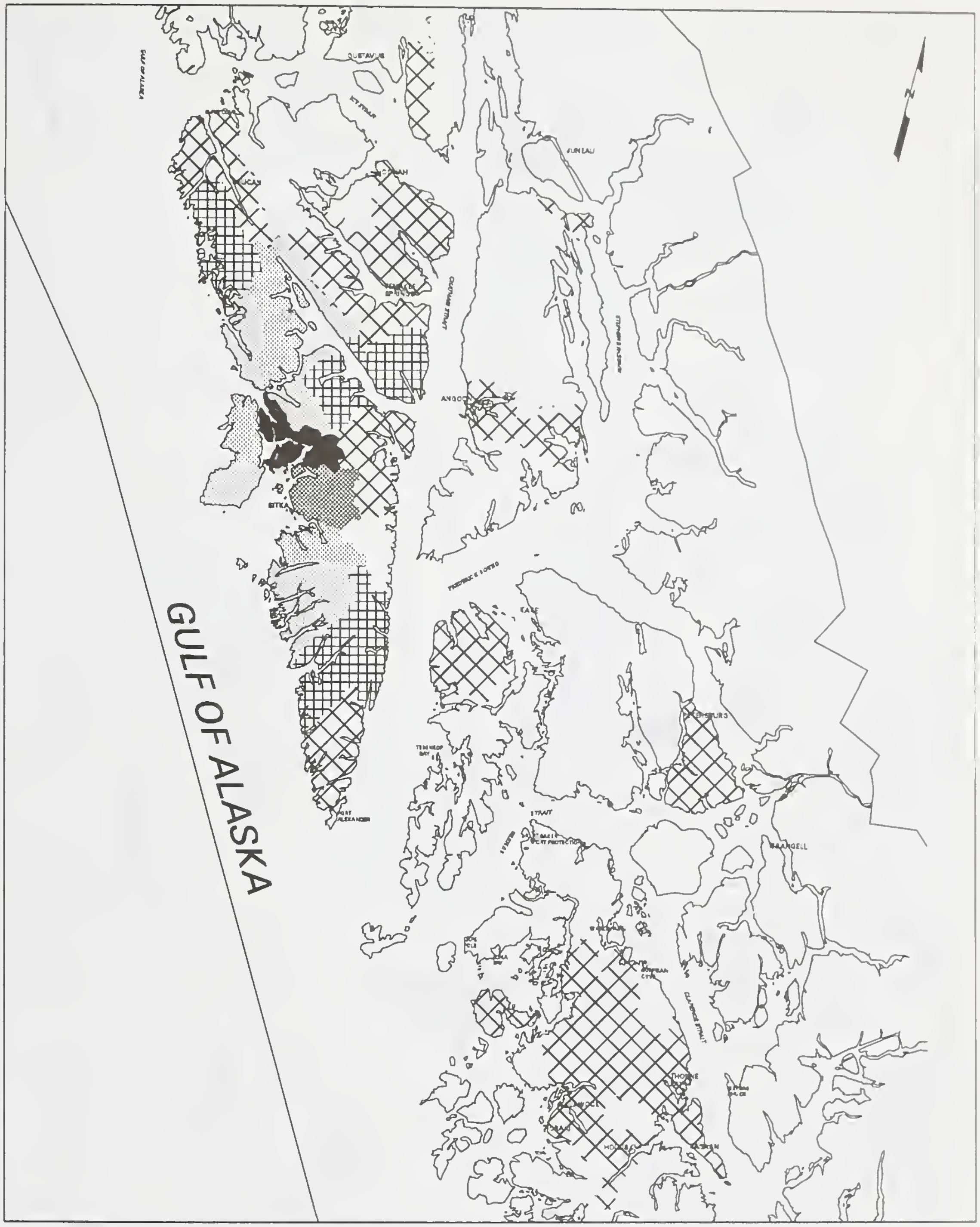
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

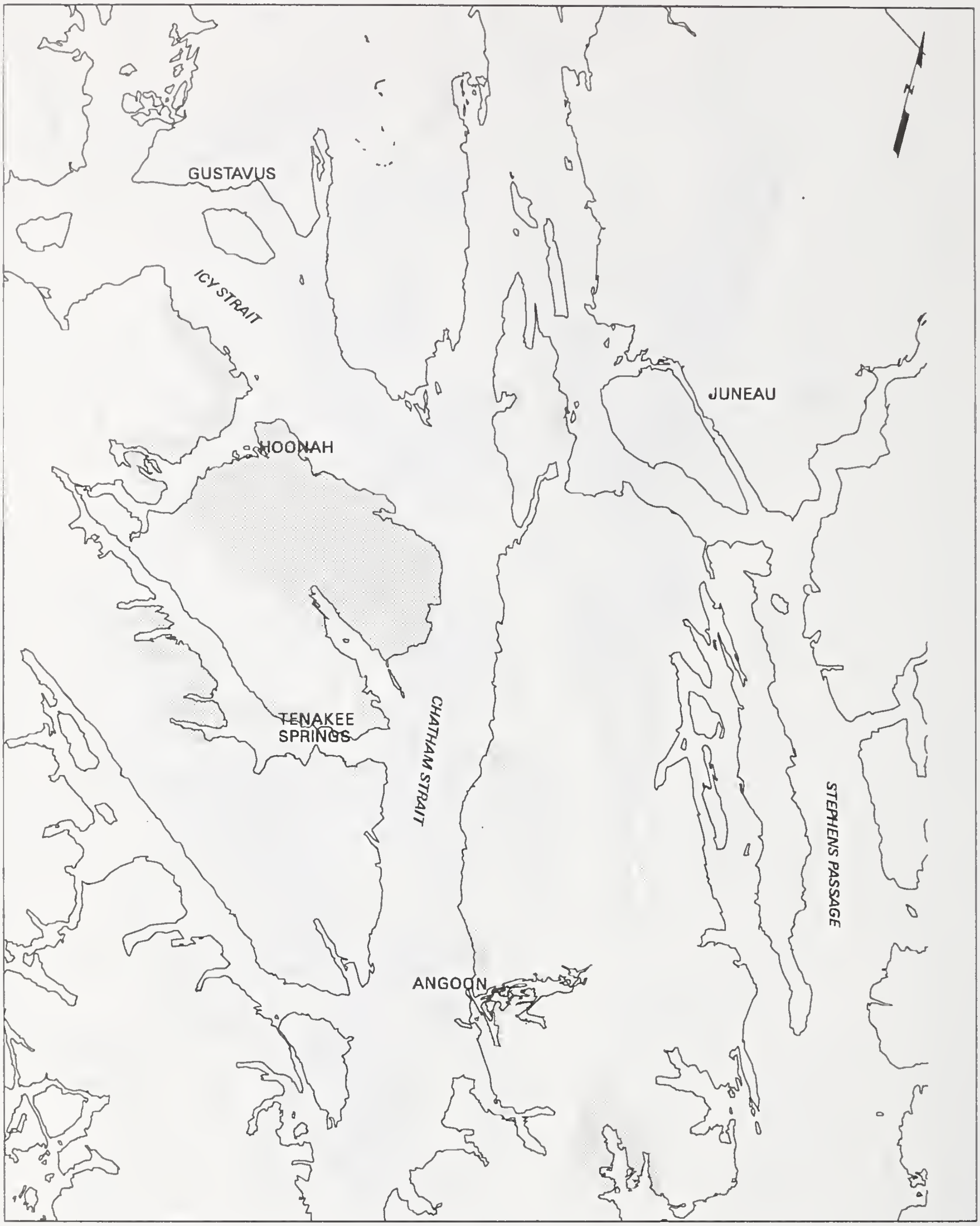
Percent of annual Sitka deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Skagway's Traditional Household Hunting Areas

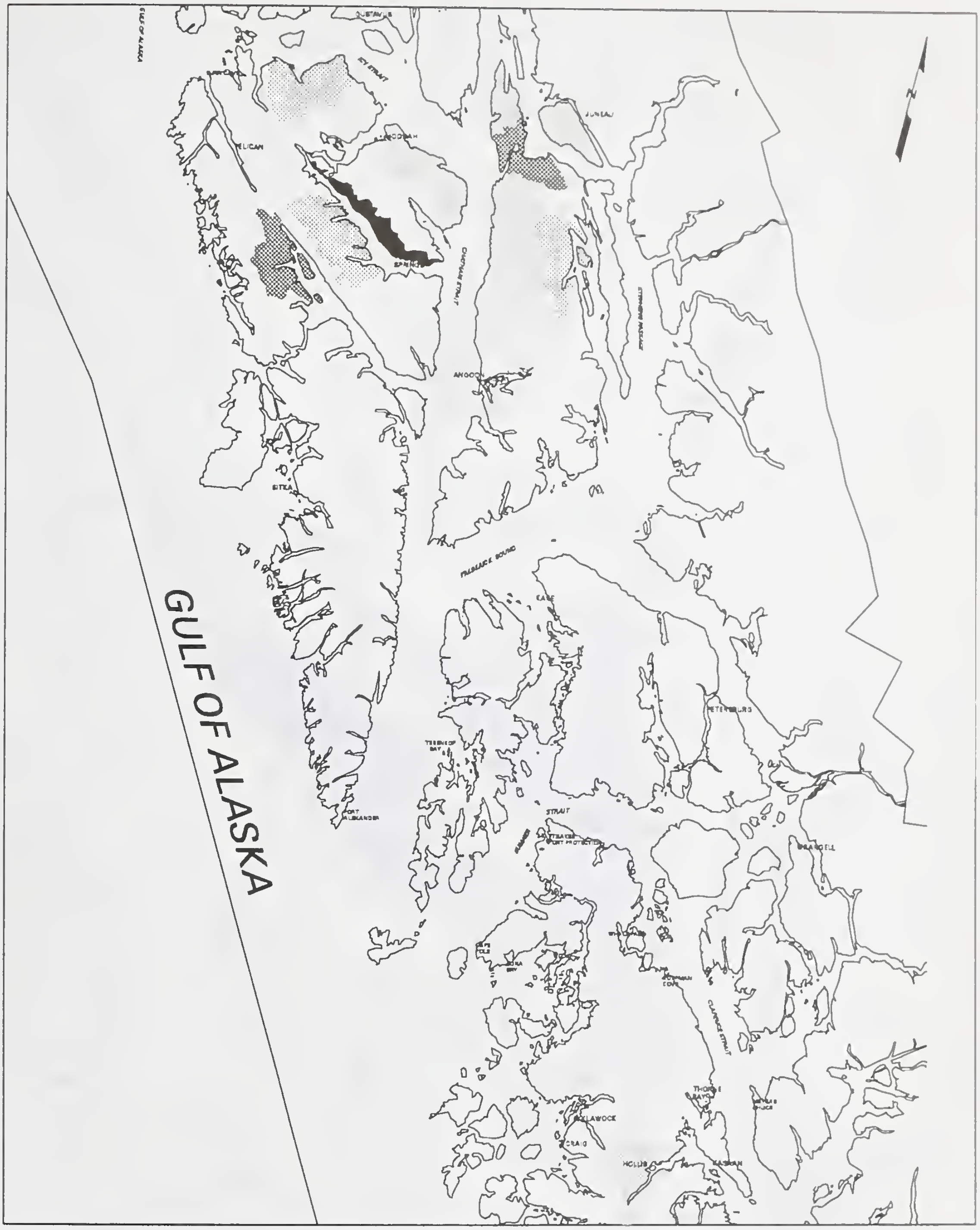


1-5 % of Households
6-15 % of Households
16-25 % of Households
> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

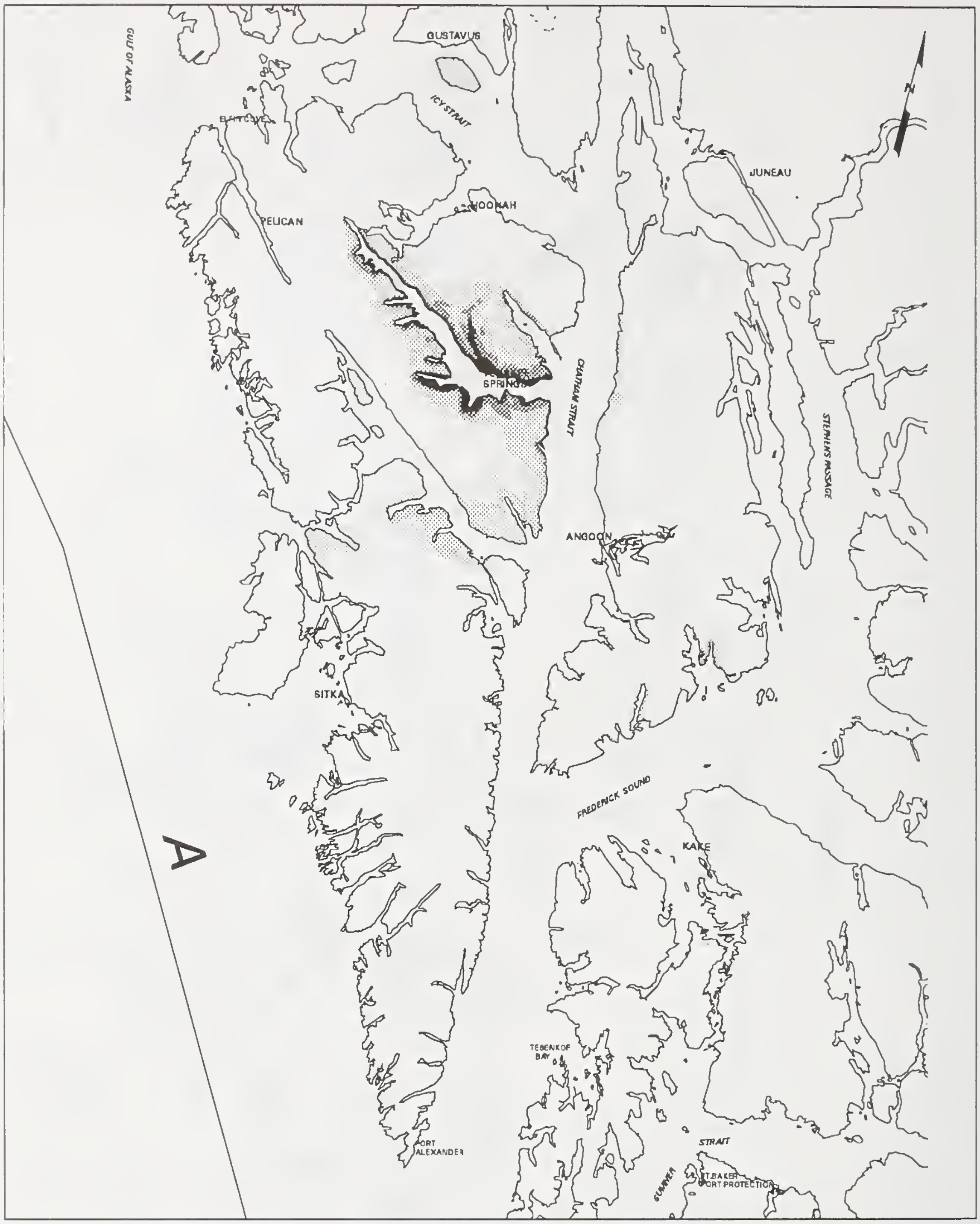
Percent of annual Skagway deer harvest by WAA, 1987-1994



(cross-hatch pattern)	Less than 1 Percent
(grid pattern)	One to 3 Percent
(light stipple)	Three to 5 Percent
(stipple)	Five to 10 Percent
(dark stipple)	Ten to 15 Percent
(solid black)	Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Tenakee Springs' Traditional Household Hunting Areas

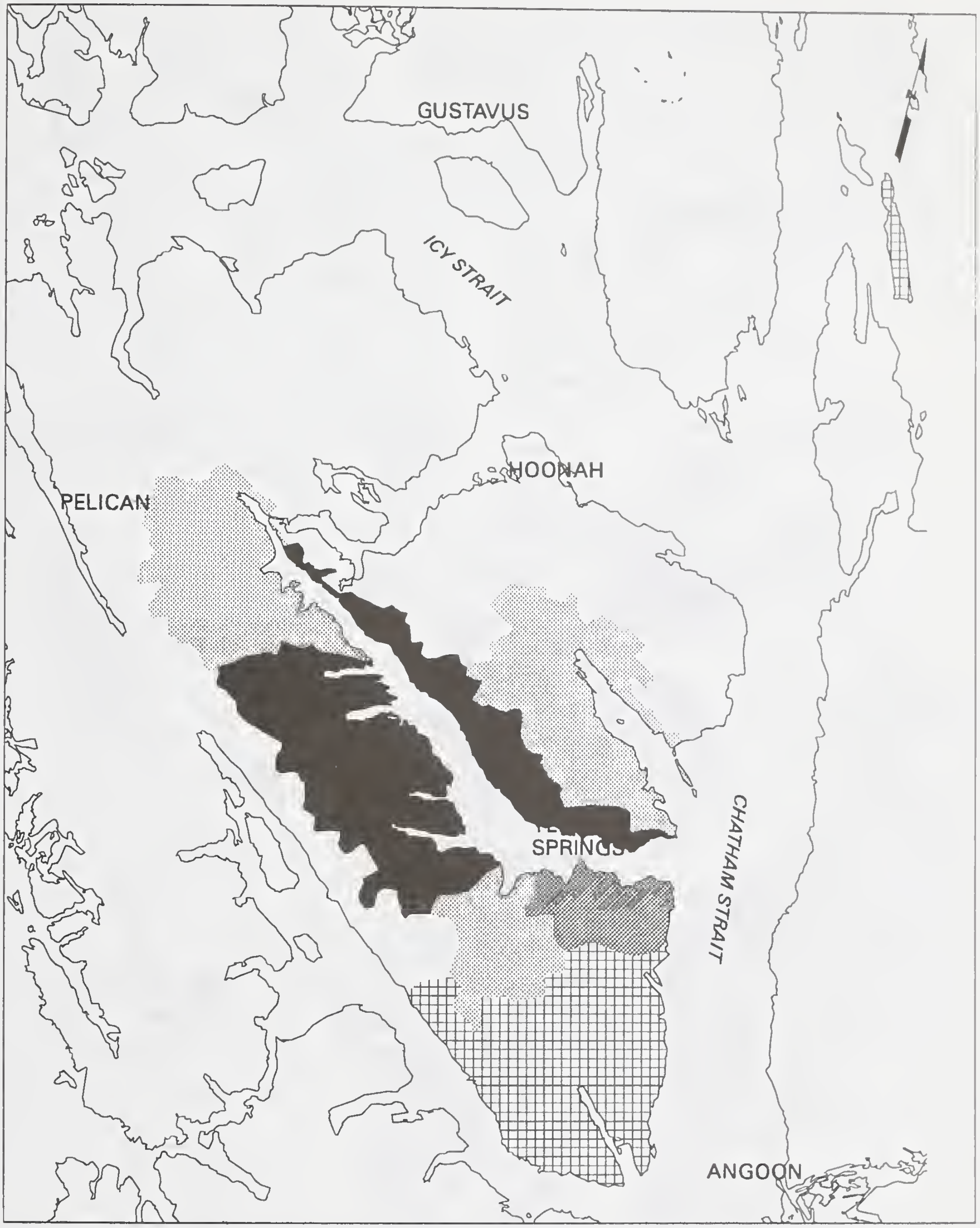


- 1-5 % of Households
- 6-15 % of Households
- 16-25 % of Households
- > 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

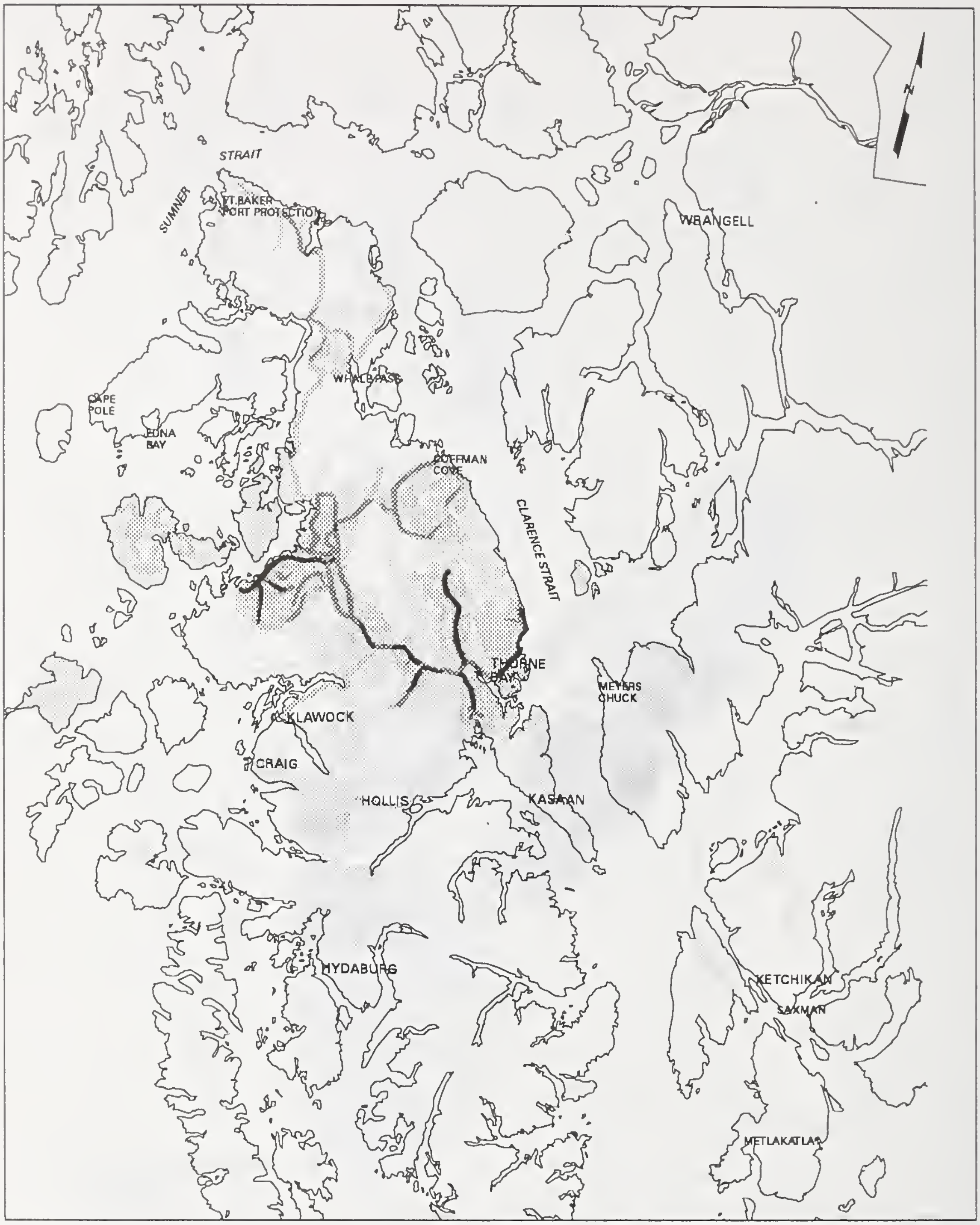
Percent of annual Tenakee Springs deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Thorne Bay's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

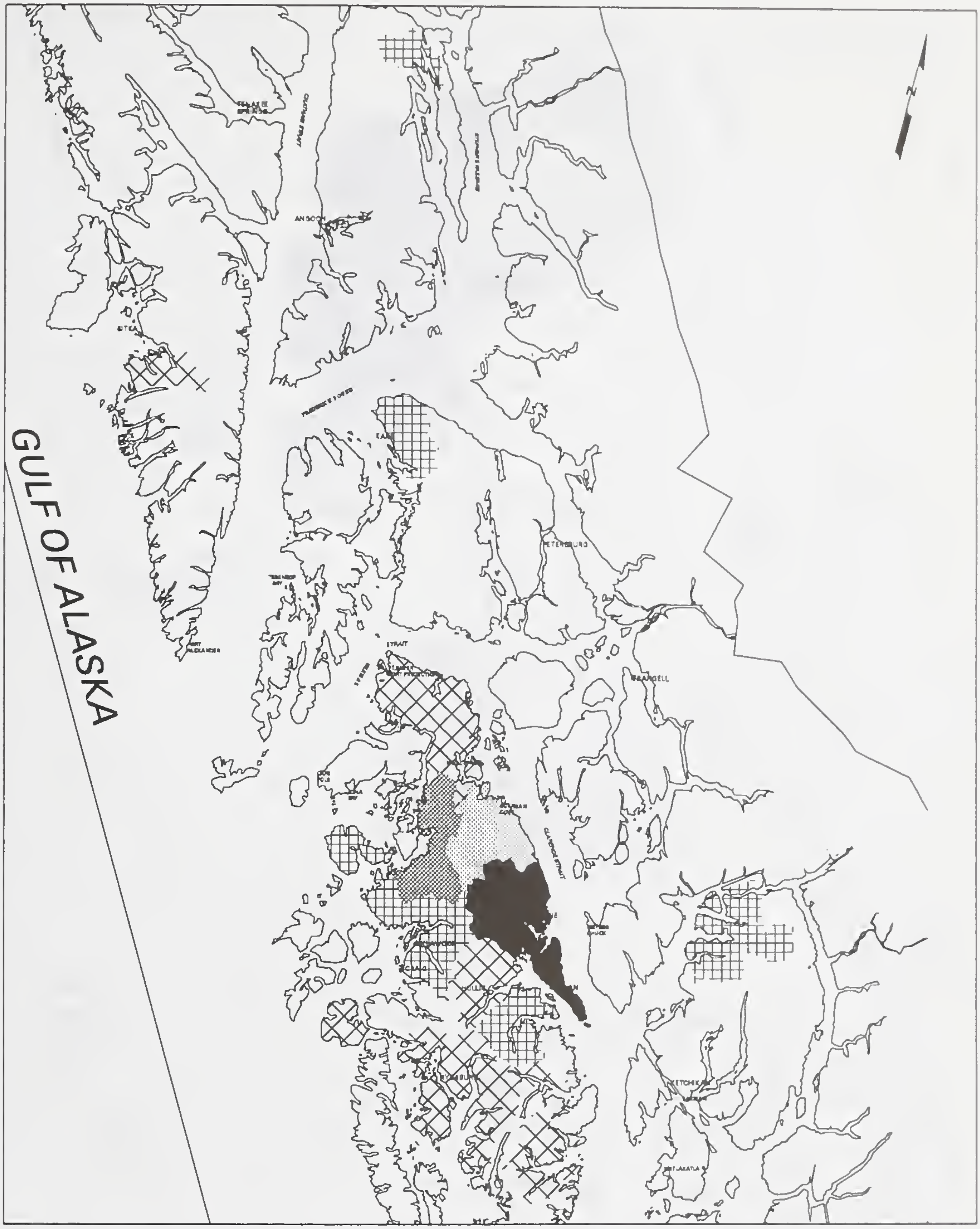
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

Percent of annual Thorne Bay deer harvest by WAA, 1987-1994



Less than 1 Percent
One to 3 Percent
Three to 5 Percent
Five to 10 Percent
Ten to 15 Percent
Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Whale Pass' Traditional Household Hunting Areas

1-5 % of Households

6-15 % of Households

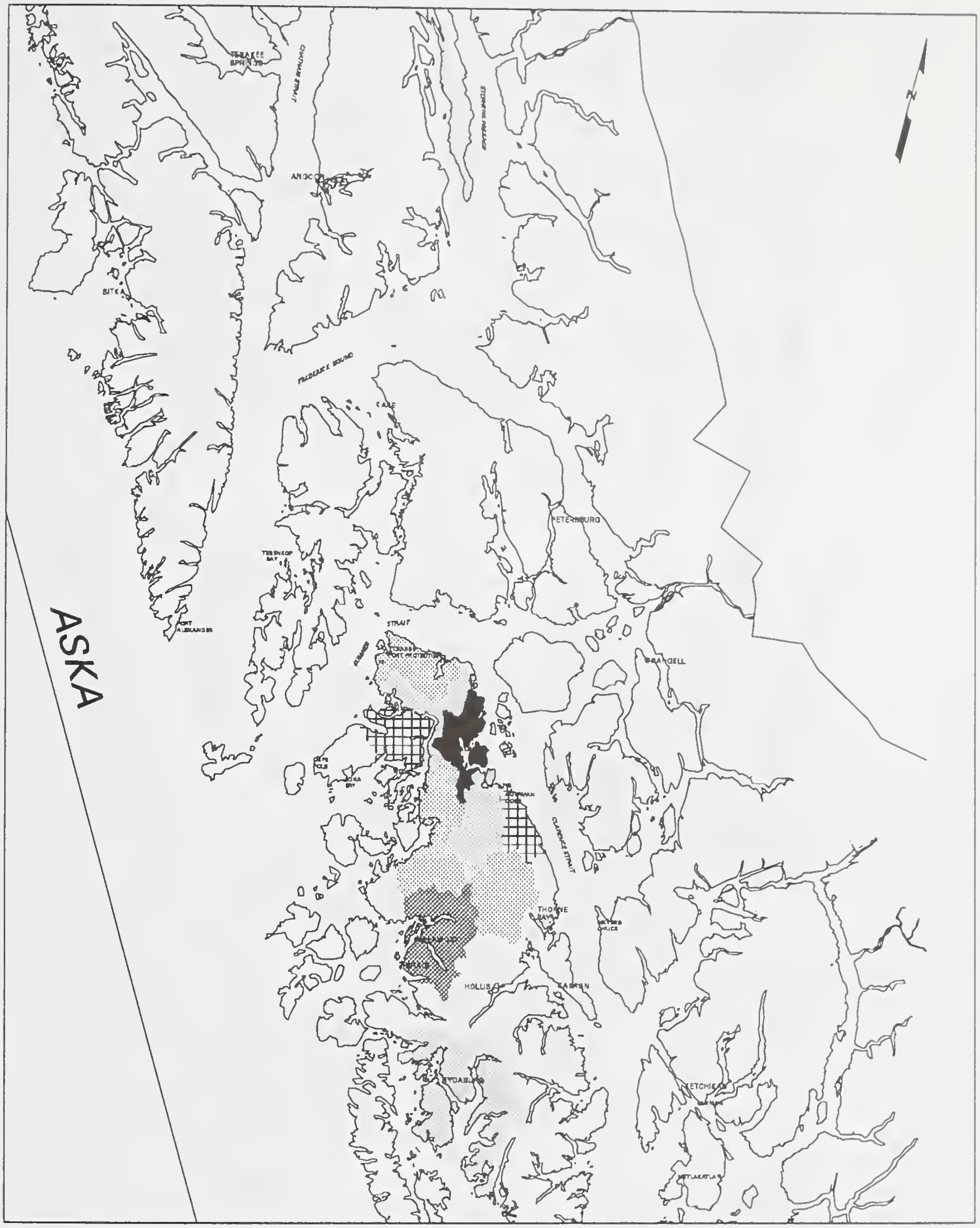
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

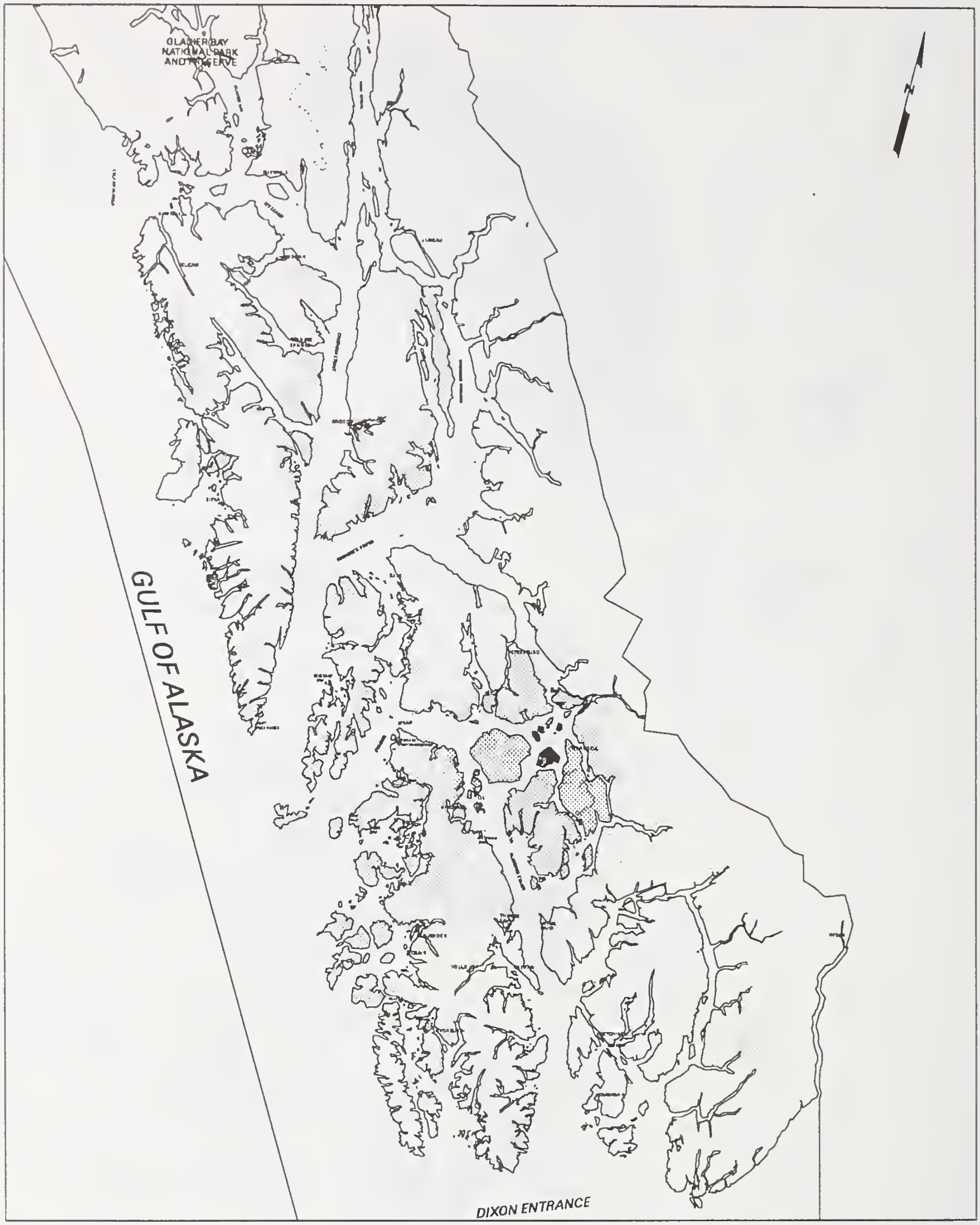
Percent of annual Whale Pass deer harvest by WAA, 1987-1994



- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Wrangell's Traditional Household Hunting Areas



1-5 % of Households

6-15 % of Households

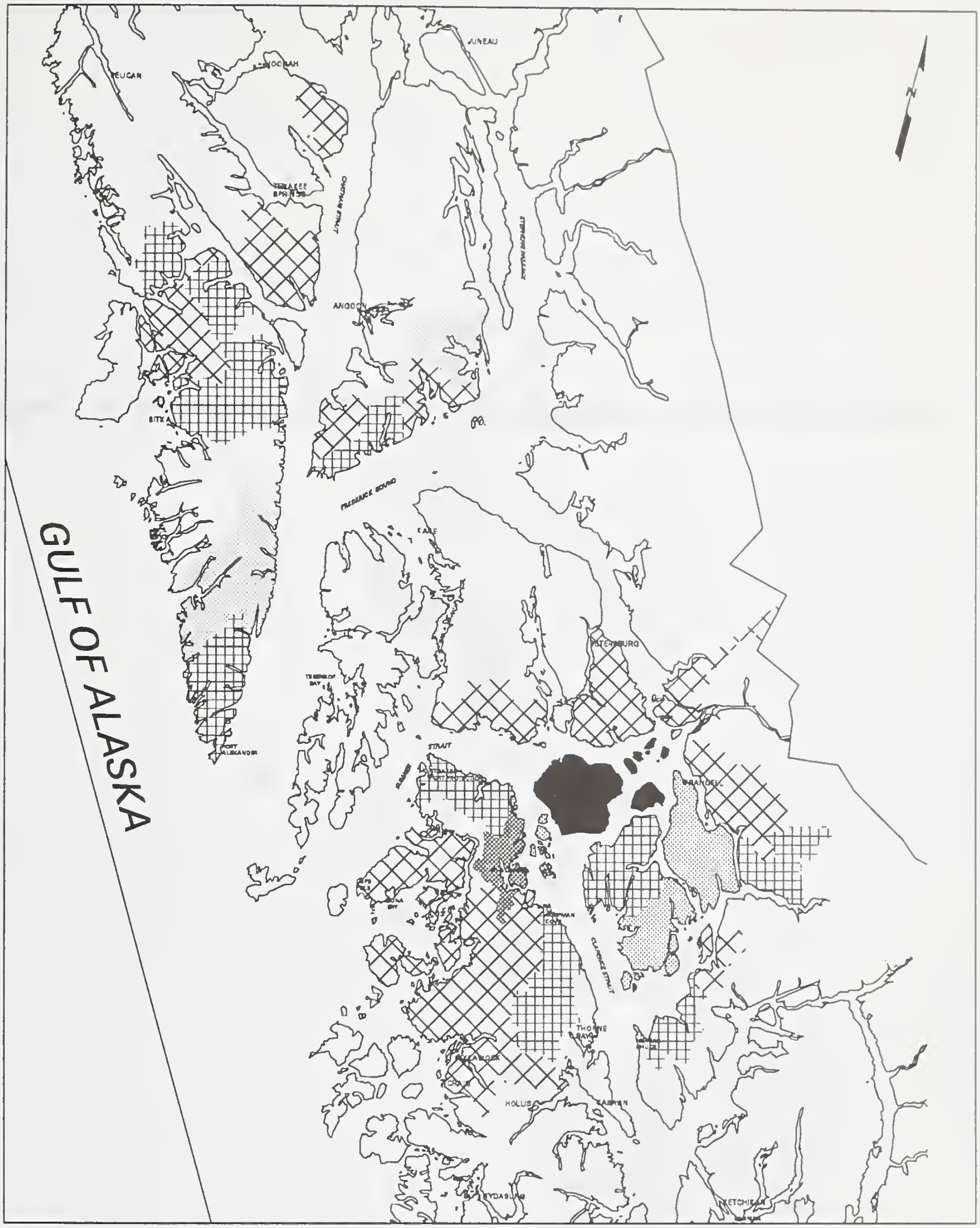
16-25 % of Households

> 25 % of Households

During the 1987 TRUCS survey, respondents were asked to indicate on a map where household members have hunted deer while living in this community.

Source, TRUCS 1988

Percent of annual Wrangell deer harvest by WAA, 1987-1994

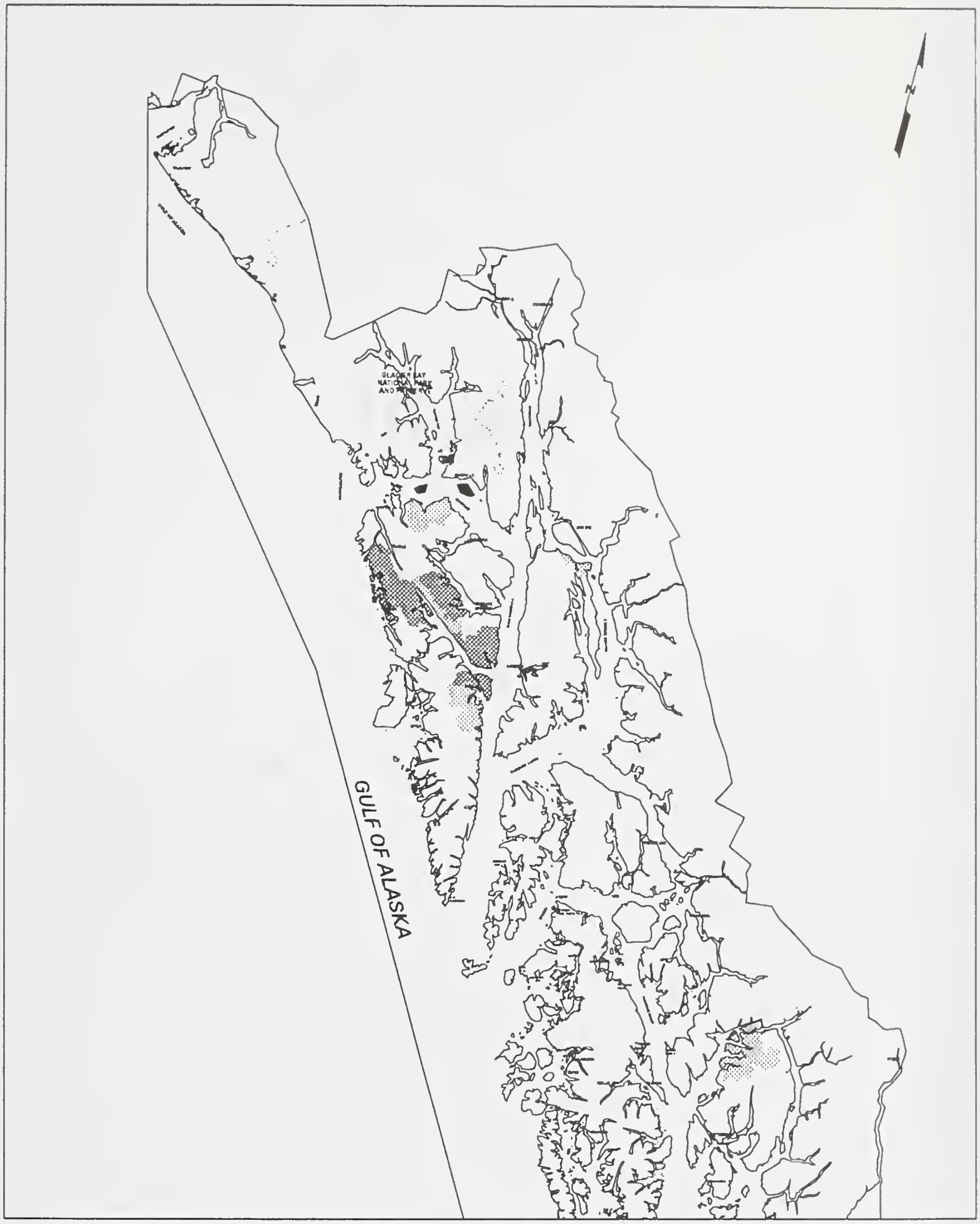


- Less than 1 Percent
- One to 3 Percent
- Three to 5 Percent
- Five to 10 Percent
- Ten to 15 Percent
- Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Traditional Household Hunting Data from TRUCS not Available for Yakutat

Percent of annual Yakutat deer harvest by WAA, 1987-1994



Less than 1 Percent

One to 3 Percent

Three to 5 Percent

Five to 10 Percent

Ten to 15 Percent

Greater than 15 Percent

The shade or pattern associated with each Wildlife Analysis Area (WAA) indicates the annual average percentage of the community's total deer harvest during 1987-1994, according to Alaska Department of Fish and Game Hunter Surveys.

Index

Index

☆ U.S. GOVERNMENT PRINTING OFFICE: 1996 - 790-124 / 21942 REGION NO. 10