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Ushk Bay Timber Sale(s)

Final Environmental Impact Statement

Volume I

Ushk Bay Timber Sale(s)

Final Environmental Impact Statement

U.S.D.A. Forest Service, Alaska Region

Tongass National Forest, Chatham Area

Sitka Ranger District

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Abstract: The U.S. Forest Service proposes six alternatives for making timber volume available: (A) No Action; (B) to concentrate activities in Ushk Bay and Poison Cove while avoiding Deep Bay and visually sensitive areas along Peril Strati; (C) to maximize the availability of timber volume while avoiding visually sensitive areas through group selection cuts; (D) to disperse activities; (E) to maximize the availability of timber volume throughout the Project Area; and (F) to concentrate activities in Ushk Bay, Poison Cove, and Deep Bay while avoiding visually sensitive areas along Peril Strait.

Table of Contents

Chapter 1
Purpose and Need

Chapter 2
Alternatives Including the Proposed Action

Contents

Contents

Contents

Chapter 4 Environmental Consequences

Contents

Contents

List of Tables

Chapter 2

Chapter 3

Contents

Chapter 4

Contents

List of Figures

Chapter 1

Purpose and Need

Chapter 1
Purpose and Need

In compliance with federal regulations, the USDA-Forest Service has prepared this Final Environmental Impact Statement (EIS) for proposed timber harvest activities in the Ushk Bay Project Area. The EIS is divided into four main chapters, outlined in Figure 1-1, with supporting material included in the Appendices.

Chapter 1 of the EIS presents the following subjects:

- Purpose and need for the proposed action
- The proposed action
- Decisions to be made
- Project location
- Background
- How this project relates to the Tongass Land Management Plan (TLMP)
- How the Ushk Bay area was selected
- Issues being addressed
- Issues that will not be addressed
- Permits and licenses
- Legislation related to this EIS

Project Overview

Purpose and Need

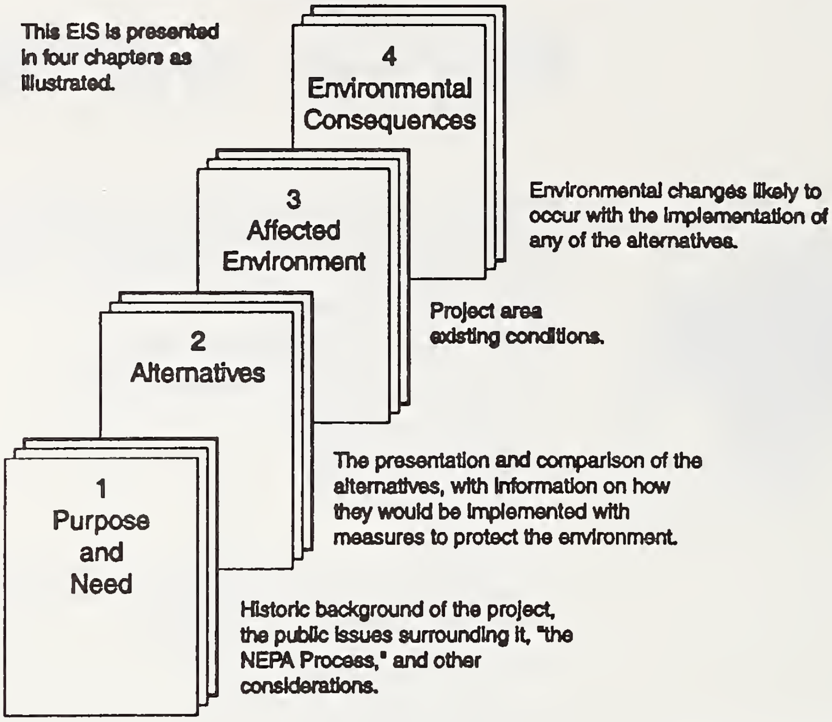
The purpose of this project is to consider specific alternatives for harvesting timber within the project area given the guidance in the Tongass Land Management Plan (TLMP), as amended (USDA Forest Service 1979, 1986a). The TLMP presently directs us to manage most of the Project Area for intensive resource use and development, with an emphasis on commodity resources. Furthermore, the TLMP specifically schedules timber sale preparation for the entire Project Area.

The proposed vegetation management and timber production within the Ushk Bay Project Area specifically addresses three identified needs. These are: 1) to implement Forest Plan direction for the Project Area; 2) to help meet market demand for timber in Southeast Alaska; and, 3) to move toward the desired future condition for the Project Area by harvesting mature stands of suitable timber and replacing them with faster growing, managed stands of second growth timber, capable of long-term timber production (USDA Forest Service 1979, 1991c). Additional direction, standards, and guidelines influencing the Ushk Bay Project are included in the Alaska Regional Guide and applicable Forest Service manuals and handbooks.

Proposed Action

Analysis of the demand for timber volume through 1995, under terms of the revised long-term contract with Alaska Pulp Corporation (APC), indicated that between 55 and 100 million board feet of volume would need to be made available from the Ushk Bay Project Area in 1994. The April 14, 1994 decision to terminate the contract ended APC contract volume obligations. Since

Figure 1-1
How this Environmental Impact Statement is Organized



termination of the APC contract, an independent sale program market assessment (Morse 1994) was completed. The assessment indicates that the Ushk Bay volume is still needed to contribute to the projected independent sale program (See Appendix O, Enclosure 1). The Ushk Bay Project was one of a series of timber harvest projects that were being considered within the APC contract boundary. These projects will now contribute to the independent sale program and the Ketchikan Pulp Company contract (See Appendix O, Enclosure 2).

An evaluation was done on whether the change from a long-term timber sale contract offering to an independent timber sale, and other information that has become available since the DEIS, constituted significant new circumstance or information relevant to environmental concerns to warrant preparing a supplement to the DEIS. The determination was that a supplement to the DEIS was not needed before releasing the FEIS and ROD. The evaluation is included in Appendix L.

Decisions to be Made

Based on the environmental analysis, the responsible official must decide whether or not and, if so, how to make timber available from the Ushk Bay Project Area in accordance with implementation of the TLMP. The decisions will include:

- The volume of timber to make available in this area in one or more timber sales
- The location of timber harvest units
- The location of arterial and collector road systems
- The location of log transfer facilities
- Mitigation measures and enhancement opportunities for sound resource management
- Whether there may be a significant restriction on subsistence uses

Project Location

The Ushk Bay Project Area is located in the Tongass National Forest on the southwest end of Chichagof Island, approximately 30 air miles north of Sitka, Alaska. The Project Area encompasses approximately 44,503 acres. It contains Value Comparison Units (VCUs) 279, 280, and 281, and adjoins the West Chichagof-Yakobi Wilderness (Figure 1-2 and 1-3).

Background

In 1956, the Forest Service entered into a contract with the Alaska Lumber and Pulp Company (later renamed Alaska Pulp Corporation) for the sale and logging of timber in Southeast Alaska for a 50-year period beginning in 1961 and ending in 2011. During this period, the contract provided for the harvest of 4,974,700,000 board feet of timber within the contract area, which included parts of Baranof, Chichagof, Kuiu, and associated islands. On September 30, 1993, APC suspended operation of its Sitka pulp mill. Among other reasons cited for the indefinite shutdown were the prolonged periods of poor markets, increasing production costs, and a shortfall in the amount of timber available at an affordable price. As a result of this shutdown, the Forest Service on April 14, 1994, officially terminated the Long-term Timber Sale Contract with APC. Termination of the APC contract shifted the focus for making timber volume available from the Ushk Bay Project Area from long-term timber sale contract offerings to competitive independent timber sales.

An independent sale program market assessment was done in May, 1994 (See Appendix O, Enclosure 1) that affirmed market demand for timber volume in Southeast Alaska irrespective of the APC contract. This recent market assessment, in the wake of termination of the APC contract, resulted in the environmental analysis for the Ushk Bay Project Area continuing, but without the APC contract being the vehicle for making volume available from the Project Area.

Relationship of this Project to the TLMP

This project would implement decisions consistent with the management direction of the Tongass Land Management Plan (TLMP), as amended, which provides land and resource management direction for the Tongass National Forest. The TLMP has four Land Use Designations (LUDs - see *Glossary*) which guide management activities for this project. The Environmental Impact Statement prepared for the TLMP was programmatic in nature and focused on forest-wide issues.

The Tongass National Forest is in the process of revising the TLMP. This revision is presently underway but there is no projected date for the decision.

For the purpose of this project EIS, the LUDs and standards and guidelines of the TLMP will be used to guide project development. Proposed standards and guidelines in the preferred alternative of the TLMP revision may also be used, as long as they do not conflict with existing standards and guidelines. Line officers may then choose to develop and select project alternatives containing direction which would be commensurate with proposals in the revised TLMP. For example:

> The visual quality objective guidelines in the current TLMP may be less restrictive than the ones in the revised TLMP. Although the direction proposed in the revised TLMP is not a legal requirement until the revised TLMP Record of Decision is signed, line officers may still choose to use the more restrictive guidelines for current project development, with appropriate display and analysis contained in the project EIS.

Management Areas

Management Areas (MA) are formed of one or more contiguous Value Comparison Units and allocated to land use designations. Anticipated management activities are assigned to each MA in the TLMP, as amended. Two Management Areas are a part of the Ushk Bay Project Area. Management Area C-39 covers the majority of the project area, incorporating all of VCUs 280 and 281. Management Area C-40 consists of eleven VCUs, but only VCU 279 lies within the

Figure 1-2
Ushk Bay Project Area

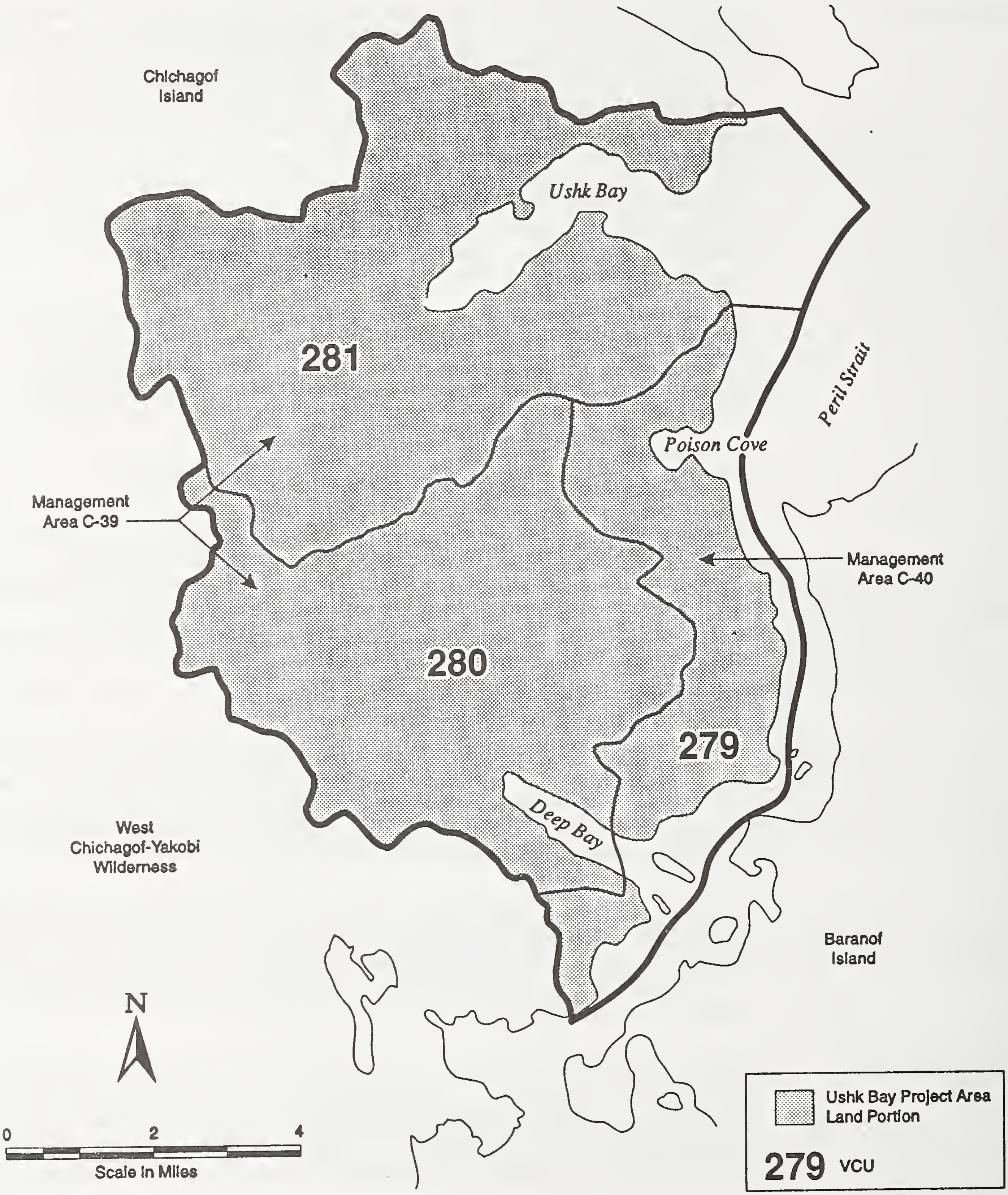
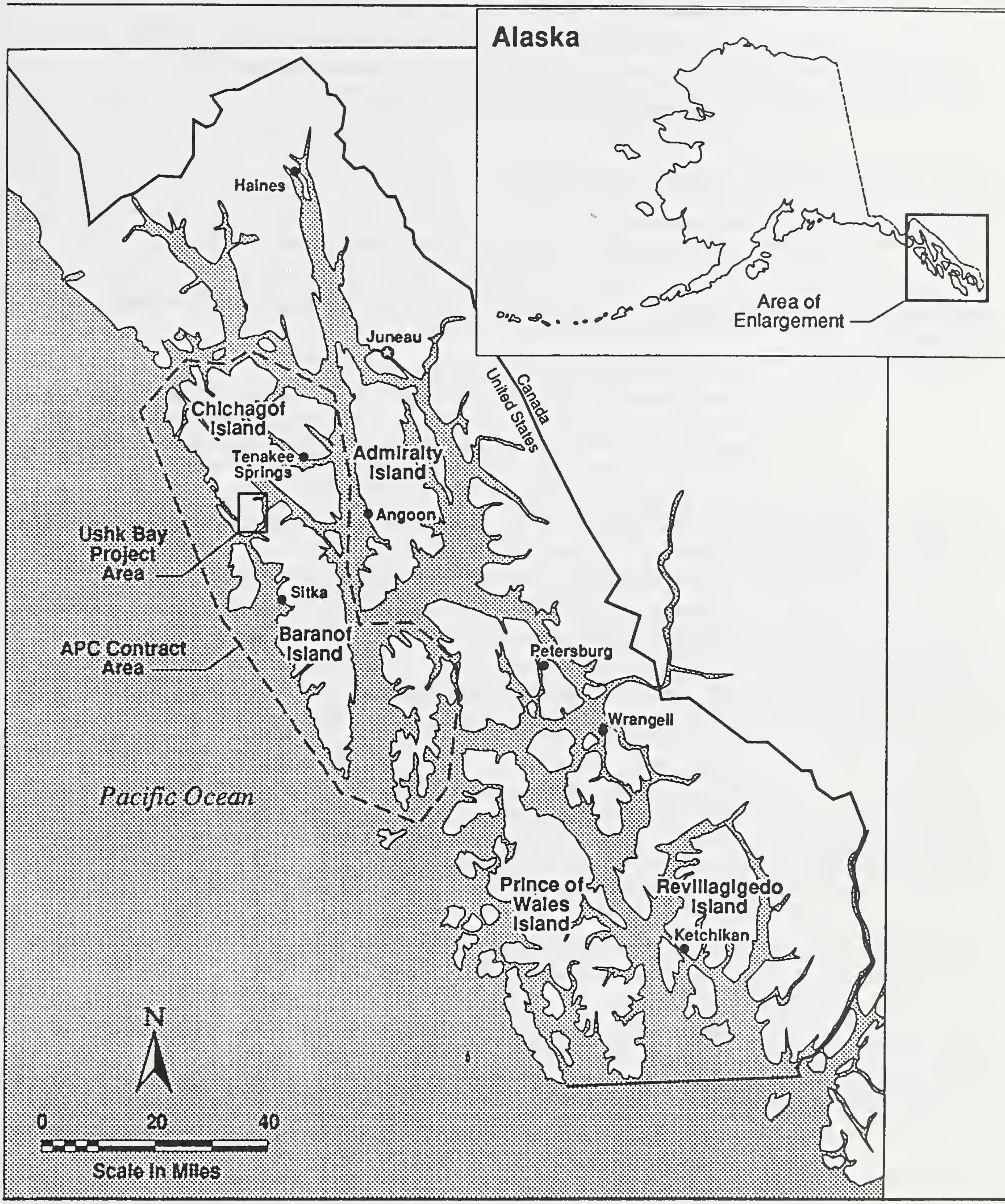


Figure 1-3
Vicinity Map



Project Area. Approved management activities specified in the TLMP as amended for these specific areas are outlined below.

Management Area C-39

- Road construction in VCUs 280 and 281 and pre-road 3 miles in Deep Bay
- Timber sale preparation for the 1986-90 period and 1991-1995 period
- Recreation facility near Ushk Bay in VCU 281
- Reforestation
- Timber stand improvement

Management Area C-40

- Timber sale preparation for the 1986-90 period and the 1991-95 period

Land Use Designations

The Ushk Bay Project Area is allocated to LUD III and IV areas as described below. See the *Glossary* for a full definition of these LUDs.

LUD III, Management Area C-40, VCU 279

Areas allocated to LUD III are to be 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. LUD III 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. Specifics include:

- 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 recreation facilities is permitted;
- A full range of fisheries improvement projects is permitted.

LUD IV, Management Area C-39, VCUs 280 and 281

Areas allocated to LUD IV provide opportunities for intensive development of resources. Emphasis is primarily on commodity or market resources and their uses. Amenity values are also considered. When conflicts regarding competing resource use arise, resolution most often would be in favor of commodity values. Allowances in calculated potential timber yield have been made to provide for protection of physical and biological productivity. Specifics are the same as listed above for LUD III areas except for the following:

- Timber is to be harvested primarily by clearcutting;
- Motorized use is permitted.

How the Ushk Bay Project Area was Selected

As part of the Forest Plan implementation process, and prior to scheduling the Ushk Bay Project Area for environmental analysis, all LUD III and LUD IV lands on the Chatham Area were analyzed and divided into approximately 50 geographical areas. Each of these small geographical areas represented a watershed or other area having commercial timber tributary to an existing or potential log transfer facility. The 50 geographical areas were then grouped into approximately 18 potential project areas for which timber harvest activities could be proposed and environmental analysis completed. The potential project areas were identified based on common geographic features, past harvesting activity, pending legislative action, and estimated available volumes of timber.

In September 1989, the Chatham Area Management Team met to evaluate the 18 potential project areas. The outcome of that meeting was to tentatively schedule 5 of the 18 areas for analysis over the next 5 years (1991 to 1996). The Ushk Bay Project Area was scheduled as one of the five project areas for EIS preparation. See Appendix A for a thorough review of the scheduling process.

The Ushk Bay Project Area was selected primarily as a result of being identified in the TLMP as containing areas of LUD IV and scheduled by the TLMP for timber sale preparation both in the 1985-89 time period and in the 1990-94 time period. Furthermore, in September 1989, based on pending legislation in Congress, it appeared that the public wanted certain areas within the Tongass National Forest to be protected from timber harvest and road construction. The Ushk Bay Project Area, however, was not included in the legislative proposals being considered by Congress for special designation; therefore, it remained eligible for harvest consideration. Ultimately this was reaffired in November 1990 with the passage of the TTRA. This act which designated areas as wilderness on Special LUD II areas, did not assign any special designation to the Ushk Bay Project Area.

Public Involvement

Scoping

The NEPA scoping process (40 CFR 1501.7) was used to invite public participation and to determine the scope of this project, including the issues to be addressed. The Forest Service sought information, comments, and assistance from Federal, State, and local agencies, and from other groups and individuals interested in or affected by the proposed action. The following steps were included in the public scoping process:

Notice of Intent. A Notice of Intent was published in the Federal Register on May 8, 1992.

Public Mailing. On June 8, 1992, a newsletter was mailed to approximately 400 individuals, organizations, and State and Federal agencies to describe the proposed project and solicit public comments. More than 50 responses to this mailing and to the publication of the Notice of Intent were received that provided substantive comments or expressed a desire to remain on the mailing list.

Public Scoping Meetings. Meetings were held in June 1992 to answer questions from the public and to receive verbal scoping comments. The following meetings were held: June 15 in Angoon, Alaska with tribal elders and city officials; and June 17 in Sitka, Alaska with the public, including representatives from the Sitka Tribal Association, Shee Atika Native Corporation, Native Subsistence Commission, Alaska Department of Fish and Game, and the Alaska Pulp Corporation.

Legal notices announcing the public meetings were placed in the Capitol City Weekly. Public service announcements and news releases were sent to radio stations and newspapers in Sitka, Hoonah, and Juneau.

Second Public Mailing. A feedback newsletter was sent to approximately 400 individuals, organizations, and State and Federal agencies on November 15, 1992. It contained a summary of the scoping process to date and outlined the issues identified during this time. Those issues specific to the Ushk Bay Project were reviewed by the Forest Service and incorporated into the analysis of the alternatives.

1 Purpose and Need

Draft EIS

Availability of Draft EIS for Public Comment. Availability of the Draft EIS was announced in the *Federal Register* on June 11, 1993, with the deadline for public comment listed as July 26, 1993. An extension of the comment deadline to August 25, 1993 was also published in the *Federal Register.*

Subsistence Hearings. A subsistence hearing was held in Sitka, Alaska on July 19, 1993. Announcement of time and location of the hearing was included in the letter accompanying every document and was announced in the *Federal Register,* the Capitol City Weekly, Hoonah Community Television, and KTOO Public Radio. Comments on subsistence and on other issues were recorded. An open house to describe the analysis process and answer questions was held in conjunction with the subsistence hearing.

Final EIS

Approximately 295 individuals, agencies, and organizations submitted written comment on the Ushk Bay Draft EIS. In addition, 15 verbal testimonies were received at the subsistence hearing. Written comments and subsistence comments were analyzed and incorporated into the Final EIS as appropriate. Public comments submitted for the 1986-90 Operating Period EIS (USDA Forest Service 1986) regarding this Project Area are incorporated by reference. The complete analysis of public comment and the Forest Service response to public comment is presented in Appendix M.

The Final EIS has been filed with the Environmental Protection Agency and is available to the public. Copies of the legal notices and newspaper articles, as well as comments received, are included in the project Planning Record.

Issues

The significant issues, concerns, and management opportunities identified through the public and internal scoping process, as well as from public comment received on the Ushk Bay Draft EIS, are listed below as issue statements. Some of these issues were raised by the public, and some reflect Forest Service concerns about specific resources and legal requirements to meet key TLMP standards. Similar concerns were grouped when appropriate. Issues 1 - 6 were determined to be significant issues within the scope of the project. Each of these issues was important in formulating alternatives, and each alternative responds to at least one of the issues.

Issue No. 1 - Subsistence

Question: What effects will the proposed timber harvest and road construction activities have on subsistence uses?

Overview: The Ushk Bay area has been used for many generations for subsistence purposes. The protected waterways provide accessibility by skiff for subsistence hunting and fishing. Of major concern is the effect that Log Transfer Facilities (LTFs), roads, camps, and general logging activities would have on the ability of the area to produce subsistence resources. The effect of additional competition for the resources is also a concern.

Issue No. 2 - Recreational and Visual Resources

Question: How will the timber harvest and road construction activities affect recreation and visual resources?

Overview: The natural beauty of the Tongass National forest provides a backdrop for a wide variety of outdoor activities and scenic opportunities. The miles of forest and protected waterways within the Ushk Bay Project Area harbor salmon, crab, eagles, bears, deer, and unique vegetation that have been available for the enjoyment of area residents for generations. Outdoor recreation plays a major role in the lives of the local residents and provides a haven for visitors who enjoy sport fishing, hunting, hiking, and camping. The concern exists as to the extent of the visual impacts from timber harvesting activities, including the view from the ferry and cruise ship routes.

Issue No. 3 - Native Land Allotments

Question: What effects will timber harvest and road construction activities have on the Native allotment land claim at Deep Bay?

Overview: A Native allotment claim filed for a parcel of land within the proposed Ushk Bay Project Area presents concerns of logging activities adjacent to encumbered and privately owned land. The allotment claim involves land at the head of Deep Bay used for subsistence and recreational purposes. Although 4 acres of the land have formally been conveyed, the remaining 156 acres is pending. Any logging activity is opposed in this claim area due to disturbance of the land and resources.

Issue No. 4 - Socioeconomics

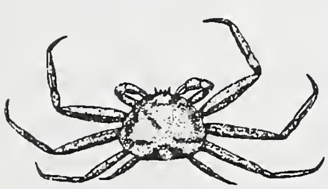
Question: What would be the socioeconomic effects of logging and associated development on Southeast Alaska residents?

Overview: A significant part of the Southeast Alaskan economy is now, and will be in the future, dependent on APC's ability to employ residents for harvesting, processing, and support activities. The issue was raised that resources must be made available to maintain the socioeconomic base dependent on the timber. Additionally, fish production resources must not be degraded by a timber harvest, since fishing is the other big industry sustaining Southeast Alaska.

Issue No. 5 - Wildlife

Question: How will timber harvest and road building activities affect wildlife habitat?

Overview: Wildlife values of the Project Area are high for species of recreational and subsistence use and also for other species that are valued for other reasons. Protection of the productivity of the habitats is a primary concern. It was recommended that surveys be conducted during prime nesting periods to determine existence and location of Northern goshawks, peregrine falcons, marbled murrelets, and bald eagle and Vancouver Canada goose nests. A field check of the project area was also requested for the spotted frog to ascertain the population status.



The coastal habitats of the project are heavily used by deer in the wintertime, which are commonly hunted by Sitkans and others. Access roads, and the associated human disturbance, may greatly affect deer, brown bear, and marten habitat and populations. Newly created areas of accessibility may also cause increased hunting and trapping pressure by logging camp residents and others.

Issue No. 6 - Fish and Shellfish

Question: How would timber harvest, road building activities, and LTFs affect fish and shellfish habitat?

Overview: The values of the Project Area are high for fish and shellfish species of recreational, subsistence and commercial importance. Protection of the productivity of the habitats is a primary concern. The large runs of pink salmon in Deep Bay could be affected by the project, which could impact the overall success of the commercial fish harvest from Salisbury Sound to Deep Bay. The establishment and long-term maintenance of 100 foot or wider buffers are required by TTRA and are necessary for long term riparian habitat needs along the anadromous fish streams that occur within the Project Area.

Deep Bay, the most productive stream in the Ushk Bay Project Area in terms of pink salmon production, is reported to be a temperature sensitive system and would require that any timber harvest activities be laid out under temperature sensitive guidelines to avoid fish die-offs due to the depletion of the oxygen supply. Public input recommended surveys to identify all anadromous fish streams and fish-bearing tributaries within the Project Area. Site-specific salmon run timing "windows" must be recognized to minimize negative impacts during construction.

Efforts in the past by the Forest Service to maintain or abandon roads have raised concern for future road management plans. The consequences of constructing or abandoning roads without either "putting them to bed" or implementing an effective and responsive maintenance program can be severe in terms of roadbed erosion, fish passage blocks, and related problems. Public scoping comments also recommended an active program to monitor and mitigate impacts through a road management program.

Other Scoping Comments

The following concerns were raised during scoping. Although they were not used to guide the development of alternatives, they are of public interest and are addressed more appropriately in other sections of the DEIS.

A - Cultural Resources
How will the timber harvest and its related activities affect the cultural resources of the area?

A concern was raised that the Ushk Bay Project could negatively impact cultural sites and areas of significance to the area tribes. A Cultural Preservation Plan is being prepared by the Sitka Tribe of Alaska that will track the cultural and subsistence concerns in the region.

Response: A Resource Inventory Report was compiled as a part of the environmental analysis to specifically address the status of cultural resources in the Project Area. Cultural resources will be avoided by the proposed project activities.

B - Mitigation and Monitoring
What will be done to minimize the potential adverse effects on area resources?

Overview: Concern was voiced that a detailed monitoring/mitigation plan be developed and adhered to in order to avoid and minimize potential adverse effects to wildlife and fish resources. Thresholds of impacts should be identified in advance that would, if exceeded, trigger specific mitigation measures.

Response: A monitoring plan is included in Appendix I of this document. Site-specific mitigation has been built into the alternatives.

C - Alternatives Selection Process
What steps are being taken in the formation of alternatives to address concerns expressed?

In order to balance contractual requirements and economic stability with the sensitivity of the area, alternatives to the proposed action must cover a wide range of options. Taking into account the response from the community during not only this scoping period but from previous testimonies on similar projects will provide a best effort to accommodate the concerns and issues raised.

Response: The process of defining alternatives begins with the publication of the Notice of Intent and incorporates comments and information accumulated during the scoping period. It is a systematic procedure that follows specific steps to identify, consolidate, and address issues of concern. The alternatives are developed to respond to the issues and, with the exception of the No-Action Alternative must meet the purpose and need. A full discussion of the alternatives development is presented in Chapter 2 of this document.

D - Cumulative Effects
What will be the effects of this timber harvest when combined with additional harvests in the area?

Cumulative effects analysis should include consideration of existing, planned and adjoining timber harvests on Baranof and Chichagof Islands. Also, evaluate how this sale will affect future management options.

Response: The National Environmental Policy Act (NEPA) requires that the cumulative effects of past, present, and reasonably foreseeable future actions be considered. The cumulative effects analysis in this document tiers to the Tongass Land Management Plan EIS and Amendment (USDA Forest Service 1979, 1986), and incorporates by reference analysis contained in the Supplement to the Draft EIS for the TLMP Revision (USDA Forest Service 1991d) in addressing forest-wide cumulative effects.

E - Citizen Review Committee
What efforts were made to obtain an accurate depiction of public sentiment regarding the Ushk Bay Project?

A citizen review committee, comprised of members of the affected communities and local native groups, should be established by the Forest Service to avoid alienation of the public. Members should be involved in the planning process.

Response: The Forest Service, under the guidelines of the NEPA process, has followed an extensive public involvement program that is detailed in Appendix B of this document.

Permits and Licenses

To proceed with the timber harvest as addressed in this EIS, various permits must be obtained from other agencies. Administrative actions on these permits would take place 60 to 75 days after the Final EIS is filed with the Environmental Protection Agency (EPA). Both EPA and the Corps of Engineers have been requested to be cooperating agencies (see 40 CFR 1501.6). The permitting agencies and their responsibilities are listed below.

U.S. Army Corps of Engineers (COE)

- Authorizes dredge or fill activities in the waters of the United States (Section 404 of the Clean Water Act).
- Authorizes structures which may impede navigation in navigable waters of the United States (Section 10 of the Rivers and Harbors Act of 1899).

U.S. Environmental Protection Agency (EPA)

- Authorizes point source discharge based on a National Pollutant Discharge Elimination System (NPDES) review (Section 402 of the Clean Water Act).

State of Alaska, Department of Natural Resources (DNR)

- Authorizes occupancy and use of tidelands and submerged lands.

State of Alaska, Department of Environmental Conservation (DEC)

- Authorizes disposal with a Solid Waste Disposal Permit.
- Issues a Certificate of Reasonable Assurance which is incorporated into the Army Corps of Engineers permit. This certifies that there is a reasonable assurance that the proposed activity will meet or exceed State water quality standards (Section 401 of the Clean Water Act).

Legislation Related to This EIS

Shown below is a brief list of laws pertaining to preparation of EISs on federal lands. Some of these laws are specific to Alaska, while others pertain to all federal lands.

- Alaska Native Allotment Act of 1906
- National Historic Preservation Act of 1966
- National Environmental Policy Act (NEPA) of 1969 (as amended)
- Clean Air Act of 1970 (as amended)
- Alaska Native Claims Settlement Act (ANCSA) of 1971
- Marine Mammal Protection Act of 1972
- Endangered Species Act of 1973
- Forest and Rangeland Renewable Resources Planning Act of 1974
- National Forest Management Act (NFMA) of 1976 (as amended)
- Clean Water Act of 1977
- Alaska National Interest Lands Conservation Act (ANILCA) of 1980
- Federal Cave Resource Protection Act of 1988
- Tongass Timber Reform Act (TTRA) of 1990
- Native American Graves Protection and Repatriation Act of 1990

In addition, the Coastal Zone Management Act (CZMA) of 1976, as amended, pertains to the preparation of the EIS. This act, passed by Congress in 1976 and amended in 1990, requires federal agencies conducting activities or undertaking development affecting the coastal zone to ensure that proposed developments are consistent with approved state coastal management programs to the maximum extent practicable. The State of Alaska passed the Alaska Coastal Zone Management Act in 1977 to establish a program that meets the requirements of the Coastal Zone Management Act. This program, as amended, contains the standards and criteria for determining the consistency of activities within the coastal zone.

The Forest Service has evaluated the preferred alternative to ensure that the activities and developments being proposed are consistent with approved coastal management programs to the maximum extent practicable. The results of this determination are presented in the *Other Environmental Consequences* section at the end of Chapter 4.

Availability of the Planning Record

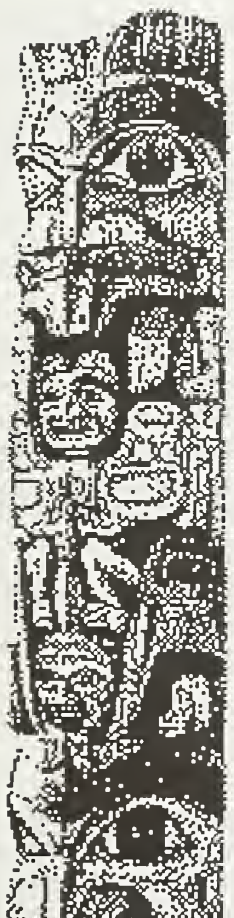
An important consideration in preparation of this EIS has been reduction of paperwork as specified in 40 CFR 1500.4. In general, the objective is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated.

The Planning Record is available upon issuance of the Final EIS at the Forest Supervisor's office, Sitka, Alaska. Other reference documents such as the Tongass Land Management Plan (TLMP, as amended 1979a), the Tongass Land Management Plan Revision DEIS (TLMP 1991a), the Tongass Timber Reform Act, the Resources Planning Act, and the Alaska Regional Guide EIS are available at public libraries around the region as well as at the Supervisor's Office in Sitka.

Chapter 2

Alternatives Including the Proposed Action

Chapter 2
Alternatives Including the Proposed Action



Chapter 2 describes the proposed action and alternatives to the proposed action. The proposed action is to make approximately 89 million board feet (MMBF) of timber volume available while implementing the Tongass Land Management Plan (TLMP), as amended, in the Ushk Bay Project Area. Chapter 2 also summarizes the process used to develop alternatives that respond to the scoping issues described in Chapter 1 and discusses the alternatives considered but eliminated from detailed study. The last part of this chapter discusses, compares, and evaluates the six alternatives selected for detailed study. Also included in this chapter are discussions of actions common to all alternatives, enhancement opportunities, and mitigation measures.

This chapter is considered to be the heart of the EIS because it contains the key elements needed by the decision maker. It describes the alternatives and compares them based on the information and analysis in Chapters 3 and 4. These later chapters contain the detailed scientific basis for establishing a baseline and measuring the environmental consequences for each of the alternatives. Of course, for a full understanding of the alternatives and the analysis, a reader must consider the details included in Chapters 1 through 4 of the EIS.

Formulation of Alternatives

Each alternative presented in this EIS responds differently to the issues discussed in Chapter 1. Six alternatives, including the No-Action Alternative, were developed and evaluated for the Ushk Bay Project. The action alternatives were developed as site-specific proposals, the environmental consequences of which could be clearly displayed. Collectively, the action alternatives were formulated to explore ways to satisfy public concerns and resolve issues, while responding to the purpose and need for the project. This range of alternatives provides the responsible official with the basis for selecting an action that provides the most public benefit.

The alternative formulation process has been guided by several concepts and principles of sound resource management. Each alternative follows the standards, guidelines, and direction contained in the TLMP, the Alaska Regional Guide, and applicable Forest Service manuals and handbooks, which are based on long-standing Forest Management principles. They also meet the requirements of the Tongass Timber Reform Act (TTRA).

Ecosystem management, another concept incorporated into forest management in recent years, addresses forest management on two levels: 1) the landscape level, which considers effects of management practices over large areas, such as a watershed, a viewshed, or a VCU; and 2) the stand level, which deals with individual harvest units. Practices employed at the landscape level may include maintaining large tracts of undisturbed old growth by concentrating timber harvest in certain areas, using beach fringe and stream buffers for corridors between old-growth blocks, and designing harvest units to "fit" into the landscape. Stand-level practices may include reducing harsh edges by unit placement and feathering of cutting-unit edges and providing for added stand diversity by leaving snags or retaining small patches of uncut timber, where feasible and practical. These concepts were considered in the selection and design of individual harvest units and roads that became part of the alternatives.

A systematic, interdisciplinary approach was used in developing the timber harvest unit and transportation system plans for this project. The standards, guidelines, and concepts mentioned above were followed by the Interdisciplinary Team (IDT). The design and selection of harvest units, roads, and LTFs became a "pool" which could be assigned to any of the alternatives. From this road and unit pool, the IDT created the alternatives to respond to the issues (see Chapter 1).

After the public scoping period ended and concerns were discussed with State and Federal agencies having jurisdiction and expertise, the issues for use in developing the alternatives were described. Components of the road and unit pool were combined to form alternatives that would address the issues, allow thorough analysis, and give the decision maker clear choices. The alternatives were then further refined as additional information became available through the field season. Through this process, one alternative was eliminated from detailed consideration. This alternative is discussed below. Following that, the six alternatives that are the subject of this EIS are described, including minor changes made in one alternative due to comments on the Draft EIS. The descriptions include the actions that are being proposed in each alternative.

Alternative Eliminated from Detailed Study

No Harvest in Ushk Bay Drainages

An alternative which eliminated harvesting timber in the drainages tributary to Ushk Bay and which consolidated the harvest in other drainages of the Project Area was considered. It was readily apparent that most of the harvestable timber in the Project Area is in the Ushk Bay drainages. The total recoverable volume from such an alternative would be so low that it would not be economically reasonable, therefore this alternative was rejected. The alternative of not harvesting timber in Ushk Bay drainage is embodied in the No-Action Alternative.

Alternatives Considered in Detail

Alternative A, the No-Action Alternative would result in no timber harvest and no construction of roads or LTFs. Existing log storage activities in Poison Cove would continue because of the ongoing need for a staging area for log rafts to go through Sergius Narrows during favorable tide stages. Continuing harvest activities outside the Ushk Bay Project Area from various timber sale areas north and east of Sitka may require the transport of logs through the Narrows. This could require expansion of that storage into Ushk Bay, under permits for which applications have been submitted, even without timber harvest in the Ushk Bay Project Area.

Alternative A

The No-Action Alternative would not meet the purpose and need of the project. It is included here, in compliance with NEPA regulations, to provide a baseline against which the action alternatives are evaluated.

Figure 2-1 shows the locations of old-growth forest and previous timber harvesting in the Project Area.

Alternative B

The essential components of Alternative B are given in Table 2-1. Alternative B consolidates timber harvest in areas accessible to proposed LTFs in Ushk Bay and Poison Cove. No road connection between the two LTFs is planned. The type of LTF planned for each site is discussed in the Log Transfer Facilities section below. It would have a land-based camp at Ushk Bay which would require either a second camp at Poison Cove or more likely, would require workers to commute by boat between the Ushk Bay camp and the LTF in Poison Cove. A dock and an equipment parking and service area would also be needed. No harvest of timber is planned for the area near Deep Bay or along Peril Strait. There would be 54 harvest units averaging 31 acres in size. Table 2-2 shows the harvest acres as a percent of the total land area, commercial forest land, and tentatively suitable land. Roads would be closed to traffic after the timber harvest is completed. Figure 2-2 is a map of the units and roads planned for Alternative B.

Table 2-1
Components of Action Alternatives

	Alternative				
	B	*C*	*D*	*E*	*F*
Harvest Acres	1,670	3,096	1,430	2,783	1,898
Volume (MMBF)	50.6	84.8	46.5	90.3	62.4
Road Miles	36.2	62.3	49.5	64.6	47.0
Camp	Ushk	Ushk	Ushk	Poison Cove	Poison Cove
LTF(s)	2	4	3	3	1

Source: Smith and Johnson, 1993.

Table 2-2
Acres of Harvest[1] on Tentatively Suitable Forest Land, Commercial Forest Land and Land Area, by VCU - Alternative B

		Percent Harvested of the Total		
VCU	**Proposed Harvest**	*Tentatively Suitable*	*CFL*	*Land Area*
279	199	6.0	4.5	2.6
280	298	13.6	7.1	1.8
281	1,173	24.7	14.0	5.8
Totals	1,670	16.3	9.9	3.8

Source: Smith and Johnson, 1993
[1] Does not include right-of-way acres between units

Alternative C

Alternative C would allow the harvest of the same units as Alternative B plus some areas south of Poison Cove and in the Deep Bay watershed. See Table 2-1 for the essential components of this alternative. Harvest units near Deep Bay and south of Poison Cove would require LTFs at these locations. Group-selection harvest would be added in some of the visually sensitive areas along Peril Strait. Group selection harvest would occur within six units totaling 579 acres of which approximately 104 acres would be harvested. The groups would be approximately 2 acres in size, and up to 25 percent of the timber within the unit boundaries would be harvested. There would be a total of 84 clearcut units in this alternative averaging 30 acres in size. Table 2-3 shows the harvest acres as a percent of the total land area, commercial forest land, and tentatively suitable land. This alternative also lacks a connected road system. A floating camp located in Ushk Bay is planned for this alternative. Docks and equipment storage and service areas would be needed at the remote LTFs in Deep Bay and Poison Cove. Roads would be maintained after harvest to provide recreational access by high clearance or off-road vehicles. Figure 2-3 is a map of the units and roads planned for Alternative C.

Alternative D

Alternative D would disperse the harvest units so as to facilitate a potential second harvest within the 100-year rotation and create areas of different forest vegetation age classes within the planning area. See Table 2-1 for the essential components of this alternative. There would be 46 harvest

Table 2-3

Acres of Harvest[1] on Tentatively Suitable Forest Land, Commercial Forest Land and Area, by VCU - Alternative C

VCU	Proposed Harvest	Percent Harvested of the Total: *Tentatively Suitable*	*CFL*	*Land Area*
279	688	20.7	15.6	9.1
280	680	31.0	16.3	4.0
281	1,728	37.4	21.2	8.7
Totals	3,096	30.6	18.5	7.0

Source: Smith and Johnson, 1993

[1] Does not include right-of-way acres between units

Table 2-4

Acres of Harvest[1] on Tentatively Suitable Forest Land, Commercial Forest Land and Land Area, by VCU - Alternative D

VCU	Proposed Harvest	Percent Harvested of the Total: *Tentatively Suitable*	*CFL*	*Land Area*
279	288	8.7	6.5	3.8
280	357	16.3	8.5	2.1
281	785	16.5	9.4	3.9
Totals	1,430	13.9	8.4	3.2

Source: Smith and Johnson, 1993

[1] Does not include right-of-way acres between units

units averaging 31 acres in size. Table 2-4 shows the harvest acres as a percent of the total land area, commercial forest land, and tentatively suitable land. Alternative D would also connect the road system between LTFs at Ushk Bay, Poison Cove, and Deep Bay, and would use a land-based camp located at Ushk Bay. This road system would be maintained after harvest for motorized recreation. This alternative would have higher first-entry costs but provide an opportunity for a more economical second entry, thus dispersing the harvest temporally and geographically. Second entry could likely occur in approximately 50 years when the timber within the harvested units would be large enough to allow a commercial thinning. Figure 2-4 is a map of the units and roads planned for Alternative D.

Alternative E

Alternative E would have LTFs at Ushk Bay, Poison Cove and Goal Creek; a land-based camp would be located at Poison Cove. See Table 2-1 for a summary of the components of this alternative. There would be a road connection over the pass between Ushk Bay and Deep Bay to allow logs to be hauled to the LTF planned for Ushk Bay. The planned LTF at Poison Cove would not be connected by road to either Ushk Bay or Deep Bay. In order to maximize the timber volume available, more and larger units are planned in the foreground of Peril Strait, and some harvest units include areas with slopes greater than 65 percent. There would be 93 units in this alternative averaging 30 acres in size. Table 2-5 shows the harvest acres as a percent of the total land area, commercial forest land, and tentatively suitable land. The road system would be closed following timber harvest. Figure 2-5 is a map of the units and roads planned for Alternative E.

Table 2-5

Acres of Harvest[1] on Tentatively Suitable Forest Land, Commercial Forest Land and Land Area, by VCU - Alternative E

		Percent Harvested of the Total		
VCU	Proposed Harvest	*Tentatively Suitable*	*CFL*	*Land Area*
279	465	14.0	10.5	6.2
280	667	30.5	16.0	4.0
281	1,651	34.8	19.8	8.1
Totals	2,783	27.1	16.4	6.2

Source: Smith and Johnson, 1993

[1] Does not include right-of-way acres between units

Alternative F

Alternative F would, like Alternative E, have the LTF and the camp at Poison Cove. However, it would minimize timber harvest and LTFs in the visually sensitive areas along Peril Strait, but would otherwise tend to maximize available timber volume. See Table 2-1 for a summary of the components of this alternative. There would be 58 harvest units averaging 33 acres in size. Table 2-6 shows the harvest acres as a percent of the total land area, commercial forest land, and tentatively suitable land. The road system would be closed following timber harvest. Figure 2-6 is a map of the units and roads planned for Alternative F.

Table 2-6

Acres of Harvest[1] on Tentatively Suitable Forest Land, Commercial Forest Land and Land Area, by VCU - Alternative F

		Percent Harvested of the Total		
VCU	Proposed Harvest	*Tentatively Suitable*	*CFL*	*Land Area*
279	199	6.0	4.5	2.6
280	531	24.2	12.7	3.1
281	1,168	24.6	14.0	5.8
Totals	1,898	18.5	11.2	4.3

Source: Smith and Johnson, 1993

[1] Does not include right-of-way acres between units

Actions Common to All Alternatives

All action alternatives would include building roads and LTFs, harvesting timber, and providing camp facilities for workers. For each of these activities, a range of options and methods is available. The various options and methods selected for any of the action alternatives are described below. With these defined, the consequences of these actions on the various natural resources can be evaluated.

Roads

Timber harvest in Southeast Alaska typically requires a road network to transport logs from harvest units to a log transfer facility (LTF). This network is made up of specified arterial, collector and local roads, built to appropriate standards to handle planned traffic and to minimize impacts to the environment. They are normally intended to provide long-term access for recurrent resource management activities. Arterial and collector roads are the backbone of the transportation system, accessing large land areas. Local roads are generally dead-end roads branching off of arterials or collectors to service small groups of units or a single unit. In addition to these, temporary roads are constructed when needed for one-time, short-term harvest access; these generally serve only one or two harvest units. After log haul is completed, temporary roads are effectively taken out of service by waterbarring the roadbed and removing drainage structures. The miles of road construction planned by alternative and VCU is displayed in Table 2-7.

Table 2-7
Estimated Road Construction in Miles

VCU	Alternatives B	C	D	E	F
279	5.1	11.8	7.5	12.9	5.2
280	6.1	13.5	15.4	13.2	15.1
281	25.0	37.0	26.6	38.6	26.9
Total	36.2	62.3	49.5	64.6	47.0

Source: Hemphill, 1992

Streams encountered during road construction are crossed by culverts or bridges. Bridges are used where large volumes of water are anticipated and where culverts would be less advantageous in efficiently transporting the water, considering scouring, channel bedloads, geometry, and other factors. Bridges on specified roads are normally designed to pass a 50 to 75 year flood event. Construction materials may include modular steel, treated timber, or log stringers. Bridges proposed for Alternatives B, E, and F would be removed as the road system is closed after harvest. Bridges would be left in place in Alternatives C and D where is it planned to maintain the road system after harvest.

Table 2-8
Numbers of Stream Crossings by Stream Class

Stream Class	Alternative B	C	D	E	F
I	29	59	52	52	48
II	18	26	19	24	22
III	37	74	53	87	45
Total	84	159	124	163	115

Source: Bjerklie and Reub, 1993

Culverts are used to cross small drainages and to provide relief drainage under the road as necessary. Culvert sizes are based on the expected volume of water produced by a 25 to 50 year flood event. Culverts placed in Class I or II streams are installed to allow fish passage.

Both the Tongass Timber Reform Act and the Tongass Land Management Plan require that Best Management Practices (BMPs) be used to prevent degradation of streams during road construction. The BMPs prescribe numerous timing and construction constraints for instream road construction work. Fish passage requirements for Class I and II stream crossings are also specified. Table 2-8 lists the number of stream crossings within each alternative by stream class.

After construction, the road system is managed to provide necessary access for accomplishing land use objectives and activities. Environmental protection, user safety, and preservation of improvements for future use are all taken into consideration when formulating a road management plan. Roads may be physically or administratively closed, obliterated, or maintained open. Commonly used methods of road closure include signing, barricading, gating, and alder encroachment. Roads that are permanently closed have all drainage structures removed to provide free passage of storm runoff. Rock can be removed from temporary roads and stock-piled for use in future road construction. Tables 1-5 in Appendix K indicate, by alternative, how the roads will be managed following timber harvest.

Log Transfer Facilities

Three commonly used types of LTFs, the low-angle slide, the A-frame, and the low-angle drive down type, transfer logs directly to salt water for rafting and transport. Each of these LTFs are designed to reduce the velocity at which logs or log bundles enter the water, and they minimize bark loss and the attendant impacts on the marine environment. All three LTF types require anchored log-and-cable booms in the water to contain the log bundles while they are being formed into rafts for transport. A "boom boat" guides the log bundles from the LTF to make up rafts for towing to the mill. The shoreward ends of the log boom are anchored or secured to a tie-point on shore. Rafts are secured to the boom to prevent the log bundles from grounding at low tide.

A fourth LTF type, less commonly used in Southeast Alaska, is a barge-loading facility. These avoid putting logs directly into the water, including rafts, and therefore allow only a relatively small amount of bark debris into the water, which results in essentially no deposition.

Low-Angle Slide

A low-angle slide consists of a ramp of metal rails with a slope of 10 to 15 percent along which logs slide by gravity or they may be pushed by a loader. Construction costs are relatively low, but operating costs are high by virtue of the requirement for a loader to push the logs.

One variation of the low angle metal rail slide is to float the metal rails. The shore end is stationary (fixed to a log crib bulkhead) and floatation logs are used at the "in-water end" of the rails. Log bundles are placed on the rails and pushed until enough weight is added to lower the floating end, allowing the log bundle to float off the rails. The floating rail slide significantly reduces both the amount of shot-rock fill and the size of the "footprint."

The fixed type of slide is suited for gently sloping beaches and the floating type of slide is suited for steeper beaches. Low angle slides are relatively inexpensive to re-activate once abandoned, for example, to permit salvage logging.

A-frame

Typically a bulkhead is built of logs, railroad cars, or sheet pile with rock fill upon which is set an A-frame and hoist to lift bundles off trucks and lower them into the water. An A-frame LTF uses a system of pulleys and cables to lower log bundles into the water at the face of a bulkhead. The entry velocity is controlled by the design of the system and the operator. The filling for the bulkhead will totally cover the part of the intertidal and subtidal marine habitat between the upland and the depth of water needed to float logs during low tides. The area of intertidal fill depends on the slope of the shoreline. The bulkhead face is typically 50 feet wide. Bulkhead and A-frame LTFs are adaptable to a wider range of shoreline slopes than low-angle slides. This type of LTF has high construction costs, and after a period of disuse may be expensive to reactivate. The A-frame type LTF has low operating costs. This type is suited for beaches with steep gradients. It is not recommended for gently-sloping beaches because of extensive filling necessary to reach water with sufficient depth for operations.

Low Angle Ramp LTF

A low angle ramp is proposed for sites where the gradient is close to 15 percent. This type of facility would be constructed from quarry rock and would be designed with a surface area 30 feet

wide by 200 feet long, and terminate at a -5 tide elevation. The operation would require a 988 type loader to drive down the ramp and place the logs in the water. The ramp is inexpensive to construct, requires very little maintenance and is inexpensive to re-activate once abandoned. The size of the footprint is reduced over rail ramps less than 15 percent.

Table 2-9 indicates the locations of LTFs for each alternative. Table 2-10 shows the estimated volume of timber each LTF would process for each alternative.

Barge LTF

A barge LTF is typically constructed much like the bulkhead and A-frame type. However, they have less flexibility in the physical features required for siting. The water depth at the face of the bulkhead for a barge facility has to be deep enough for a loaded barge. The face must be wide enough to allow a safe and functional tie-up of the barge. To accommodate these needs, the slope of the beach must be steeper than for an A-frame, the size of the fill area significantly larger, or dredging may be required. Barges are generally loaded using wheeled loaders that drive from the bulkhead onto the barge, thus requiring a securely moored barge. Because no log sorting can be done on the barge, an upland sorting yard nearby is also a requirement. Barge LTFs are expensive to construct and to operate. None of the alternatives propose a barge facility, but the option may be available in Ushk Bay at a location other than the proposed LTF site.

Table 2-9

LTF Locations by Alternative

Alternative	South Ushk Bay	North Ushk Bay	North Poison Cove	South Poison Cove	Goal Creek	Deep Bay	Total
A							0
B	A			D			2
C	A		S		S	S	4
D	A		S			S	3
E		D		D	S		3
F				D			1

Source: Cameron, 1993

A = A-frame and bulkhead type

D = Low-angle drive down type

S = Low-angle slide type

Timber Harvest Systems

Yarding is the process of conveying logs from where they have fallen to a collection area. This can be done using ground-based equipment, cable logging systems, or helicopters. The method used depends upon many factors, including access, topography, slope, and resource protection concerns. Four timber harvest methods are expected to be used in one or more of the action alternatives. Those logging systems include shovel, high lead, a variety of skyline systems, and helicopter.

Shovel logging is the process of moving logs from the stump to the collection area by repeated swinging with a track mounted swing boom loader. The loader is moved off the haul road and into the harvest unit. Logs are then stacked progressively closer to the haul road with each pass of the loader until they are finally stacked at roadside. This system is best used on well drained sites with side slopes of less than 20 percent. A properly designed shovel yarded unit will require only one pass of the loader over any part of the unit.

High lead yarding is commonly used in Southeast Alaska. It is a cable yarding system utilizing

Table 2-10

Volume of Timber to be Transported Through Each LTF (in Millions of Board Feet), Total Volume of Timber to be Harvested, and Estimated Lifespan of Each LTF

	Alternative					
LTF Site	*B*	*C*	*D*	*E*	*F*	**Estimated Number of Years LTF Active**
South Ushk Bay	29.2	46.7	23.4			3
North Ushk Bay				62.4		3
North Poison Cove		25.5	17.1			3
South Poison Cove	21.4			23.2	62.4	3
Goal Creek		4.7		4.7		1
Deep Bay		7.9	6.0			1
Total	50.6	84.8	46.5	90.3	62.4	

Source: Cameron, 1993

a tower (typically 90 feet) with 1-1/4 or 1-3/8 inch mainline cable. It is best used over relatively short yarding distances (600 feet) and reasonably stable soil conditions. Logs are dragged along the ground to the landing. In situations where the logs are dragged uphill to the landing the resulting skid trails left by the logs radiate away from each other and tend to dissipate erosional sediments. The reverse is true when the logs are dragged downhill to the landing as storm runoff tends to concentrate at the landing.

Several cable systems in use in Alaska and the Pacific Northwest are collectively called skyline systems. These systems generally allow for longer yarding distances (1000+ feet) and keep one end or all of the log suspended above the ground for most if not all of the yarding distance.

Helicopter logging is done by slinging logs underneath large helicopters and flying them (normally downhill) to the landing. Typically helicopters are used only for situations where road access is precluded. Yarding distances can be a mile or more but the high cost of operations usually restrict their use to distances of 3000 to 4000 feet. Logs are landed either directly into the water, onto large landings for eventual truck haul to the LTF, or onto a barge for transport to the mill.

Each logging system has advantages, disadvantages and constraints which limit its applicability. Logging systems for the units which make up the various alternatives for Ushk Bay were designed to capture the advantages of each system within the applicable constraints. Table 2-11 lists the acres on which each logging system is proposed to be used by alternative.

Timber Volumes

Table 2-12 displays the distribution of timber volume to be harvested by species within each alternative. In all alternatives the dominant species are western hemlock and Sitka spruce. Mountain hemlock occurs in minor amounts. The utility column is made up of trees that, because of defect, are not suitable for saw timber.

Camp Facilities

Plans for logging camps are completed after the EIS Record of Decision has finalized the timber sale. The environmental analysis in this EIS is conducted for a typical camp that would be expected for each alternative. Figures 2-2 to 2-6 show the proposed camp locations for each alternative.

Table 2-11

Proposed Acres of Each Logging System

Alternative	Shovel	Highlead	Skyline	Helicopter	Total
B	127	70	1,296	177	1,670
C	264	183	1,780	869[1]	3,096
D	171	87	1,064	108	1,430
E	287	198	2,025	273	2,783
F	214	133	1,373	178	1,898

Source: Smith and Johnson, 1993

[1] Includes 579 acres of group selection of which approximately 104 acres would be harvested.

Table 2-12

Timber Volumes (MMBF) to be Harvested, by Species

Alternative	Western Hemlock	Sitka Spruce	Alaska Cedar	Mountain Hemlock	Utility	Total
B	23.4	8.8	6.7	1.1	10.6	50.6
C	40.2	14.4	12.4	2.2	15.6	84.8
D	21.6	7.8	7.1	1.1	8.9	46.5
E	42.6	15.1	13.1	2.4	17.1	90.3
F	29.5	11.0	7.9	1.4	12.6	62.4

Source: Smith and Johnson, 1993

A logging camp for timber sale operations of the size and duration of the Ushk Bay Project would be expected to house 50 to 100 people. This would include both individual workers and families. It would be constructed during the first year of operation while the roads are being built. The camp would be in operation for three to five years depending upon the volume of timber to be logged and number of workers employed. Camp location is dependent on several factors. It must be near an adequate source of water such as a perennial creek (preferably one that does not provide notable fish habitat); it must have access for boats and float planes, usually near the LTF; and it needs to be in a location protected from major storms, but preferably a sunny spot, not shaded by the topography.

The living and office space would be within temporary modular structures and mobile homes. In addition, one or more rough-lumber equipment storage and maintenance shops is usually needed. The camp would generally be connected to the timber harvest road system by an all-weather road. Electricity for the camp is usually provided by a diesel-powered generator.

Land based camps which require 10 to 15 acres of relatively flat ground tend to be preferred and are normally used. Good exposure to the west and south is desired but not absolutely necessary. Locating the camp close to most of the work is necessary to reduce travel time.

Floating camps can be used under the right circumstances. A good anchorage free of ice and sheltered from the wind is mandatory. The camp should be placed near the LTF and rafting areas but not so close as to interfere with those operations. Access to shore-based facilities such as repair shops and equipment sheds is required. A shore based parking area and dock connected directly to the camp is also highly desirable. A water supply, treatment plant, and storage tank on shore are also necessary. Water is then piped aboard the camp from the treated storage tank. Up to 10 acres of land adjacent to the floating camp would be cleared for the shore-based facilities. There are relatively few floating camps available in Southeast Alaska. The rafts which support a floating camp are constructed of large diameter logs lashed together with steel cable. Manufactured foam flotation is sometimes added to log rafts particularly on older rafts which become waterlogged. Protection of residents especially small children from drowning is a serious consideration when choosing to use a floating camp.

Proposed Harvest Units Over 100 Acres

Regulations implementing the National Forest Management Act (NFMA) provide that 100 acres is the maximum size of created openings to be allowed for the hemlock-Sitka spruce forest type of coastal Alaska, unless excepted under factors defined in the Alaska Regional Guide (USDA Forest Service 1983). These factors include:

- Natural and biological hazards to the survival of residual trees and surrounding stands
- Topography
- Relationship of units to other natural or artificial openings and proximity of units
- Coordination and consistency with adjacent land use designations
- Effect on water quality and quantity
- Effect on wildlife and fish habitat
- Visual Absorption Capability (VAC)
- Regeneration requirements for desirable tree species
- Transportation and harvest system requirements
- Relative total costs of preparation, logging, and administration of harvest

Where it is determined by an interdisciplinary analysis that exceptions to the size limit are warranted, the actual size limitation of openings may be up to 100 percent (200 acres) greater if required due to natural biological hazards to the survival of residual trees and surrounding stands, and 50 percent greater (150 acres) for the remaining factors. The Forest Supervisor will identify the conditions under which the larger size is warranted.

Two proposed harvest units within the Ushk Bay Project Area are larger than 100 acres. Table 2-13 displays harvest units included in one or more alternatives and the factors used in designing each opening. In each case, the resulting opening would be more than 100 acres in size. The largest unit planned in any alternative is 121 acres. These units exceed the normal 100 acre maximum unit size because of the risk of loss of timber through windthrow if the unit boundary were not established on a reasonably windfirm edge.

Table 2-13

Harvest Units or Combinations Over 100 Acres

Harvest Unit Number	Size (Acres)	Alternative	Factors Warranting a Larger Size
13	121	B,C,E,F	Natural and biological hazards to the survival of residual trees and surrounding stands; and transportation system requirements
4	121	B,C,E,F	Topography; and transportation and harvest system requirements

Source: Smith and Johnson, 1993

Post-harvest Silvicultural Treatments

Reforestation is the process of establishing a new forest on harvested areas. The Forest Service is required by law (NFMA), regulations, and policies to plan timber harvests only on lands where there is assurance that such lands can be regenerated within five years after the harvests are completed. Reforestation can be accomplished by natural seeding from surrounding timber stands or by planting. Natural regeneration is the method of choice in Southeast Alaska and usually produces satisfactory results. However, hand planting may be necessary or desirable when a natural source of seed for a desired species is inadequate to maintain a timber stand's current species composition, or when it is desirable to reduce the time needed for natural regeneration. Table 2-14 presents by alternative the potential number of acres identified for hand planting. While the number of acres to be hand planted (to maintain species composition) can be reasonably estimated before harvest, the specific location and acreage where planting will be required will not be known until post-harvest restocking surveys assess the adequacy of natural regeneration.

Natural regeneration often results in overstocked stands and necessitates a pre-commercial thinning in order to facilitate growth. Thinning is the systematic regulation of growing stock in a young forest. Trees are removed in young stands (usually at around age 15 to 30) to stimulate growth of the remaining trees and to increase financial return (Ruth and Harris, 1979). Thinning also may be done to control species composition, improve genetic composition, increase windfirmness, or for other purposes. The number of acres identified for precommercial thinning by alternative are displayed in Table 2-15. It should be recognized that precommercial thinning is done approximately 20 years after harvest and is dependent upon site, stocking, and other resource needs. Actual acres thinned will vary from those predicted in the Table due to these factors and site-specific examinations done in the future.

Table 2-14

Potential Number of Acres to Hand Plant

Alternative	Acres	Percent of Acres Harvested	Total Number of Trees
B	469	27	51,200
C	525	18	57,600
D	309	21	53,700
E	532	18	58,100
F	469	15	51,200

Source: Smith and Johnson, 1993

Table 2-15

Number of Acres Identified for Potential Precommercial Thinning

	Alternative				
VCU	*B*	*C*	*D*	*E*	*F*
279	164	312	199	367	199
280	149	584	211	625	531
281	616	952	512	1,006	1,215
Total	929	1,848	923	1,998	1,945

Source: Smith and Johnson, 1993

Enhancement Opportunities

There have been some previous harvest activities within the project area under the APC Long-Term Timber Sale Contract. Eight harvest units, comprising approximately 321 acres, were harvested between 1956 and 1966 in VCU 281 (all but 12 acres were harvested between 1963 and 1966). It may be desirable to precommercially thin these areas during the period that road access is available due to nearby timber harvesting under all alternatives. These young stands are on some of the most productive sites in the Ushk Bay area and would likely respond well to the thinning.

Fish habitat enhancement opportunities include creating borrow-type ponds adjacent to streams in the Ushk and Poison Cove watersheds. These activities could increase the quantity and quality of fish and wildlife habitat, and also provide a gravel source for road construction and reconstruction.

A stream channel on the west side of Ushk Bay was logged to both banks during earlier timber harvest. A lack of woody debris in this channel indicates the stream may have been impacted by harvest or post-harvest activities. This stream has potential for enhancement by addition of large woody debris and/or streamside thinning to promote future large woody debris.

Mitigation Measures

The Forest Service uses numerous mitigation measures in the planning and implementation of land management activities. The application of these measures begins during the planning phases of a project. They link to the overall Forest, Chatham Area, and Ranger District management direction and continue through all phases of subsequent forest management. Standards, guidelines, and direction contained in the current TLMP, the Supplement to the Draft EIS for the TLMP Revision, the Alaska Regional Guide, and applicable Forest Service manuals and handbooks have been applied in the development of alternatives and the design of harvest units and roads.

Mitigation measures adopted to reduce or eliminate adverse effects are identified at the time the Record of Decision (ROD) is signed. Issues identified during scoping assisted in defining the resource areas where mitigation was considered. Listed below is a brief summary of some of the mitigation measures common to all alternatives. Specific mitigation measures, as applied to each individual unit, can be seen in the "As Planned" unit layout cards. These unit cards are an important tool for implementing the project as they list design considerations and provide a mechanism for tracking the project implementation. Unit Cards may be found in Appendix C.

Water Quality and Production

Measures which protect water quality and fish habitat include application of the Best Management Practices (BMPs) stated in the Soil and Water Conservation Handbook (USDA FSH 2509.22). This handbook provides standard operating procedures for all stream classes. In addition, the TTRA mandates a minimum 100-foot buffer on all Class I streams and on Class II streams that flow directly into Class I streams. Of note is that the 100-foot stream buffer width mandated by TTRA is a minimum. The width of this buffer strip may be greater than 100 feet for reasons such as topography, riparian soils, a windfirm boundary, timber stand boundaries, logging systems requirements, and varying stream channel locations. In addition, certain Class III streams flow directly into or have been identified as influencing Class I streams. These Class III streams have been buffered to the slope break of the channel or to a windfirm boundary to protect water quality. Refer to Appendix C (Unit Design Cards) for the unit-specific stream buffering which is being applied. Application of BMPs and adherence to the law will protect water quality and fish habitat as well as riparian habitat important to other species such as brown bear and furbearers.

Wildlife

Mitigation measures to protect wildlife habitat that are built into the design of the alternatives include the siting of the harvest units. Harvest units are intentionally located away from important wildlife habitats (to the extent practicable) to reduce effects on wildlife. Beach and estuary fringe habitats are avoided as much as possible. Travel corridors are left untouched (where practicable) to allow undisturbed movement of wildlife.

Other measures planned to mitigate impacts include road closures, retention of snags where safe to do so, and scheduling of harvest activities to reduce disturbance to bald eagle nesting and rearing activities.

Impacts to the brown bear from bear-people interactions will be mitigated by informing logging camp residents about brown bear behavior and bear management policies. Incinerators will be used in logging camps for garbage disposal to resolve bear-garbage problems.

Subsistence

Because most subsistence use involves harvesting fish and game, mitigation measures that protect or enhance fish and game resources will also protect and enhance subsistence activities. By placing units and roads away from beach and estuary fringe habitats and away from salmon-bearing streams, mitigation measures were built into each of the alternatives considered in this EIS. Also, road management can affect access and thus be used to maintain traditional access methods and users, and scenic quality.

Recreation and Visuals

Effects of timber harvest on views from anchorages and known recreational day-use areas will be reduced by leaving buffers of timber along beaches and inland lakes to reduce direct effects on recreation opportunities and scenic quality. Roads and rock borrow pits will be located to minimize visibility where practicable in scenic viewsheds.

Comparison of Alternatives

The comparison of alternatives draws together the conclusions from the materials presented throughout the document and provides the results of the analysis in summary form. The following sections provide:

- A comparison of alternatives by identified issue;
- A comparison of alternatives by proposed activity; and
- A comparison of alternatives by environmental consequence.

Chapter 1 lists the issues that are the focus of this EIS. This section compares the alternatives in terms of these issues. The baseline for comparing the alternatives is Alternative A, the No-Action Alternative. Chapter 4 contains the detailed evaluation of the potential effects on forest resources of timber harvest and road construction activities under each alternative.

Comparison of Alternatives by Identified Issue

Issue 1: Subsistence

Based on potential direct and cumulative effects of timber harvest, there is a significant possibility of a significant restriction of subsistence use of deer in the Project Area under all alternatives, including the No-Action Alternative. There may also be a significant possibility of a significant restriction of subsistence use of fish and shellfish under Alternatives B through E. The proposed alternatives do not present a similar significant possibility of significantly restricting other subsistence uses.

Subsistence hearings were held in accordance with ANILCA Section 810. These hearings gave subsistence users an opportunity to testify on their subsistence use within the Project Area and their perceptions of probable impacts to those uses from the proposed alternatives. A transcript of the subsistence testimony is included in Appendix L.

Issue 2: Recreational and Visual Resources

Recreation

Under all alternatives, the Ushk Bay Project Area has potential to provide a wide range of recreation opportunities, activities, settings, and experiences. The change in recreation setting because of timber harvest and/or road construction activities may affect the recreational experience and, therefore, overall satisfaction of the forest visitor. Visitors seeking a Primitive or Semiprimitive recreational experience may not be satisfied in an area with active timber management activities. On the other hand, visitors who do not require a natural setting for their recreation activities may appreciate the opportunity to use a road for access to the interior of the Project Area. However, motorized recreation opportunities will be limited because the area will not be connected to a public road system or the Marine Highway.

Table 2-16 displays the percent of the various Recreation Opportunity Spectrum (ROS) classes in the Project Area following implementation of each alternative.

Alternative A would result in no change to the current ROS classifications. Alternative A provides a baseline for comparing the effects of the alternatives on the recreation resources. In all action alternatives, the acres of Primitive and Semiprimitive Motorized settings will be reduced, while the Roaded Modified acres all are increased. In Alternatives C and E, nearly half the Project Area would be changed from primitive to roaded modified designations. In Alternatives D and F, about a third, and in Alternative B, a quarter would be similarly changed. These changes will have a negative effect on those individuals seeking nonmotorized recreational experience, and will have a positive impact on those desiring a more modified setting for their activities.

Timber harvest activities under any of the action alternatives would affect outfitter/guide use throughout the majority of the Project Area. With LTFs in all three bays in the Project Area, Alternatives C and D would have the greatest potential effect on outfitter/guide use, with Alternatives E and F haviing only slightly less impact. Of the action alternatives, Alternative B would affect outfitter/guide use of the Project Area the least.

Hunting and fishing opportunities would be substantially affected by any of the project alternatives during active timber harvest. With no LTF proposed in Deep Bay in Alternatives B, E, and F, these alternatives would have the least impact on fishing and crabbing opportunities. Alternative B would have the least impact on hunting opportunities in the southern portion of the Project Area, affecting only a small part of VCU 280.

Table 2-16
Percent of Project Area in Each ROS Class

ROS Class	Alternative A[1]	B	C	D	E	F
Primitive	75	8	0	0	0	0
Semiprimitive Nonmotorized	13	60	47	61	45	59
Semiprimitive Motorized	12	8	3	0	5	9
Roaded Natural	0	0	5	0	5	0
Roaded Modified	0	24	45	33	45	32
Total	100	100	100	100	100	100

1 Alternative A, the No Action Alternative, represents the existing ROS inventory.

Source: Gault and Howell, 1993

Table 2-17

Acreage of Project Area in Each VQO

VQO		Alternative A	B	C	D	E	F
Retention	Acres	3,776	3,774	3,666	3,706	3,694	3,774
	Percent Change	0	<1	3	2	2	<1
Partial Retention	Acres	24,051	22,941	21,715	23,061	22,125	22,940
	Percent Change	0	8	10	4	8	8
Modification	Acres	12,385	11,744	11,556	11,991	11,537	11,729
	Percent Change	0	5	7	3	7	5
Maximum Modification	Acres	4,291	6,044	7,566	5,745	7,147	6,060
	Percent Change	0	41	76	34	67	41

Source: Gault, 1993

Scenic Quality

Table 2-17 displays the VQOs resulting from the implementation of the project's alternatives. A VQO for an alternative that results in an increase in Maximum Modification acreage indicates a negative effect on the visual resource.

The increase of Maximum Modification acreage represents a substantial level of change to the visual resources within the Project Area for all action alternatives. Alternative C displays the greatest increase in Maximum Modification acreage, followed by Alternatives E, F, B, and D. With Alternative A, the existing visual condition remains unchanged.

In Alternative B, harvest units would be consolidated and located mainly in several drainages in Ushk Bay and Poison Cove and not directly facing Peril Strait. Only harvest units west of Poison Cove would be visible from Peril Strait. Harvest units in Ushk Bay would be visible from small boats that enter the bay for recreational purposes.

Alternative C would harvest a large number of units in all three VCUs, including harvest units on the slopes above Peril Strait and in the Goal Creek drainage. The majority of the harvest on the slope above Peril Strait would be by group selection (an alternative harvest method where about 25 percent of the acreage within a large harvest area is harvested in two-acre patches). This method was evaluated in this alternative to determine if it would substantially reduce the visual impacts in this sensitive area. The conclusion of the analysis is that the group selection would be a slight improvement in overall visual effect (as compared with harvesting the entire area), and this alternative would have one of the largest visual impacts.

Alternative D would affect the smallest acreage of harvest units in the Project Area. Harvest units would be widely spaced and dispersed throughout the three VCUs. However, several harvest units and roads would cause high visual impacts to views from the ferry route and small boaters in Peril Strait and Ushk Bay.

Alternative E proposes the largest number of harvest units dispersed in consolidated groups throughout VCUs 279, 280, and 281. This alternative would harvest the most acreage and have the greatest overall effect on the visual resources of the Project Area.

Alternative F comprises groups of timber harvest units consolidated mainly in the large drainages of Ushk Bay, Poison Cove, and Deep Bay. Only a few of the harvest units at Poison Cove would be visible from Peril Strait. Harvest units in Ushk Bay would be visible from small boats entering the bay for recreational activities. Alternative F would have similar visual impacts to Alternative B.

Issue 3: Native Land Allotments
Alternatives B, E, and F would have no direct impacts on Native allotment claims for land parcels within the Ushk Bay Project Area. In Alternatives C and D, a proposed road on the south shore of Deep Bay would traverse land claimed under a Native allotment and would require an easement. Although no harvest units are planned for this area, the Native allotment land claim would be directly affected by construction and transportation activities associated with both Alternatives C and D. No harvest units or roads are planned in the area near Deep Bay under Alternative B.

Issue 4: Socioeconomics
Table 2-18 displays the employment (jobs), employee compensation (personal income), and contribution to gross regional product associated with each alternative. The jobs and income listed include those both directly and indirectly dependent on the timber industry. The volume of timber harvested for each alternative results in a level of jobs and salaries associated with that volume. Employment and personal income are based on the Forest Service economic model, IMPLAN.

Issue 5: Wildlife
Table 2-19 displays the acres proposed for harvest in each of the six major wildlife habitats.

A direct effect on wildlife habitats from all action alternatives would be loss of old-growth habitat and change of forest habitat. Impacts to beach fringe, estuary fringe, riparian, and alpine habitats were greatly reduced through unit and road design prior to alternative formulation. Alternative A would have no effect on wildlife habitats whereas all action alternatives would have similar impacts on each of the habitat types.

Table 2-20 displays the potential reduction in wildlife habitat capabilities for six Management Indicator Species found in the Ushk Bay Project Area, as calculated by GIS computer models. This table displays the estimated habitat capability in 1992, and the estimated reduction in this capability after the actions proposed at this time would be implemented. Habitat capability does not necessarily indicate current or future populations, but rather is a means to estimate and compare effects.

All of the action alternatives would decrease habitat capabilities by 14 percent or less for deer, 9 percent or less for brown bear, 14 percent or less for marten, 21 percent or less for river otter, 17 percent or less for hairy woodpecker, and 18 percent or less for brown creeper. Alternative A would maintain the current capabilities for the Management Indicator Species while all action alternatives would cause minor or moderate decreases in habitat capabilities for the Management Indicator Species.

Issue 6: Fish and Shellfish
The evaluation in Chapter 4 shows that the potential effects on fish are minimal for all alternatives. All alternatives meet the requirements of the Clean Water Act. Implementation of the TTRA's requirement to provide a minimum 100-foot buffer on Class I streams and Class II streams flowing directly into Class I streams will minimize direct stream channel impacts from proposed timber harvest and road construction. Adherence to Best Management Practices (BMPs) outlined in the Soil and Water Conservation Handbook (USDA Forest Service 1991a) during the design of harvest units and roads will minimize the potential direct effects to fish habitat.

The effects of timber harvest and road construction on shellfish populations would also be minimal for all the alternatives with the possible exception of Alternative E. Application of the siting guidelines developed by the Alaska Timber Task Force will minimize the potential effects of LTFs on shellfish populations. The short period of use and relatively small amount of logs that will go through the LTFs will also minimize bark accumulation. Additionally, construction of from one to four LTFs will affect so little of the available marine habitat that short-term and

Table 2-18
Timber Industry Employment and Income

	Alternative A	B	C	D	E	F
Employment (number of jobs)	0	290	478	299	509	359
Employee compensation (millions $)	0	10.23	16.88	10.29	17.97	12.51
Contribution to Gross Regional Product (millions $)	0	15.53	25.61	15.78	27.28	19.05

Source: Assam and Mott, 1993

Table 2-19
Wildlife Habitats (in acres) Proposed for Harvest or Roads

Habitat	Alternative A	B	C	D	E	F
Old-growth Forest	0	1,703	3,203	1,503	2,857	1,941
Forest	0	1,714	3,216	1,516	2,870	1,952
Riparian	0	570	962	539	977	751
Beach Fringe	0	35	79	54	86	35
Estuary Fringe	0	84	180	135	184	84
Alpine	0	0	0	0	0	0

Source: Artman, 1993

Note: Because habitat types overlap, the total acreage of habitat types exceeds the total acreage of harvest proposed under each alternative. The acreage of forest habitat is higher than the acreage of old-growth habitat because the forest habitat includes portions of proposed roads that are forested but do not meet the definition of old-growth.

long-term effects on the marine ecosystem will be minimal as a result of LTF use.

Physical access to subsistence fish and shellfish areas will not be directly changed by any of the action alternatives, but the camp and LTF may restrict use of Ushk Bay by people other than camp residents. LTF operations may cause a slight reduction in the area available for seeking fish and shellfish. Competition for fish and shellfish is likely to be increased by residents of the logging camps during timber harvest activities (three to nine years). Competition would be most noticeable for limited resources like king crabs and least noticeable for more abundant resources like pink salmon.

Table 2-21 presents a summary comparison of the proposed activities for each of the alternatives. It provides a brief comparison of timber harvested by volume and by harvest method, miles of road, number of LTFs required, and estimated index value. This table summarizes more detailed information found in Chapter 4, *Environmental Consequences*.

Table 2-22 displays a summary comparison of the anticipated consequences of each of the alternatives over the entire Project Area. It is presented by resource as in Chapters 3 and 4. Statements of levels of change are based on the amount of change between current conditions

Table 2-20

Potential Reduction in Habitat Capability for Management Indicator Species

Species	1992 Habitat Capability	Reduction in Habitat Capability *A*	*B*	*C*	*D*	*E*	*F*
Sitka Black-tailed Deer	1,385	0	-104	-180	-96	-190	-118
Brown Bear	58	0	-3	-5	-3	-5	-4
Marten	63	0	-5	-8	-4	-8	-5
River Otter	37	0	-5	-8	-5	-8	-7
Hairy Woodpecker	276	0	-26	-48	-23	-43	-29
Brown Creeper	89	0	-9	-16	-8	-15	-9

Source: Artman, 1993

and conditions which would result from the alternative actions. The criteria used for level of change were none (no change), slight (<1 to 5 percent change), minor (6 to 20 percent change), moderate (21 to 30 percent change), and substantial (greater than 30 percent change).

Table 2-21

Comparison of Alternatives by Proposed Activity

	Alternative					
	A	*B*	*C*	*D*	*E*	*F*
Volume in Net Sawlog Plus Utility (MMBF)[1]	0	50.6	84.8	46.5	90.3	62.4
Transportation System						
Number of LTFs	0	2	4	3	3	1
Miles of Road	0	36	62	49	65	47
Number of Stream Crossings	0	84	159	124	163	115
Acres of Road Clearing	0	217	374	297	388	281
Roads Interconnected	None	No	No	Yes	Yes	Yes
Road System Management Objective	None	Closed	Open	Open	Closed	Closed
Harvest Units						
Number of Clearcut Units	0	54	84	46	93	58
Number of Group Selection Units	0	0	6	0	0	0
Average Size (acres)	0	31	30	31	30	33
Number over 100 acres	0	2	2	None	2	2
Number over 150 acres	None	None	None	None	None	None
Logging Systems						
Acres High Lead	0	70	183	87	197	133
Acres Shovel Logging	0	128	264	171	287	215
Acres Skyline Systems	0	1,295	1,780	1,064	2,022	1,372
Acres Helicopter	0	178	869	108	273	178
Total Acres	0	1,670	3,096	1,430	2,783	1,898
Camp						
Type	None	Land	Float	Land	Land	Land
Location	None	Ushk	Ushk	Ushk	Poison	Poison

[1] Does not include R.O.W. volume for roads between units.

Table 2-22
Comparison of Environmental Consequences

Environmental Consequence	Alternative A	B	C	D	E	F
Forest Vegetation						
% of Forest Vegetation in Each Successional Stage						
Seedling/Sapling	0	10	20	9	17	12
Pole/Young Sawtimber	2	2	2	2	2	2
Mature Sawtimber	0	0	0	0	0	0
Old Growth	98	88	78	89	81	86
Level of Change	None	Minor	Minor	Minor	Minor	Minor
Wetlands						
% of Wetland Acreage Affected	0	3	5	2	4	3
Level of Change	None	Slight	Slight	Slight	Slight	Slight
Wildlife Habitats						
% of Habitats Affected						
Old-growth Forest	0	11	20	9	18	12
Level of Change	None	Minor	Minor	Minor	Minor	Minor
Riparian	0	12	19	11	20	15
Level of Change	None	Minor	Minor	Minor	Minor	Minor
Beach Fringe	0	2	4	3	4	2
Level of Change	None	Slight	Slight	Slight	Slight	Slight
Estuary Fringe	0	4	8	6	8	4
Level of Change	None	Slight	Minor	Minor	Minor	Slight
Alpine	0	0	0	0	0	0
Level of Change	None	None	None	None	None	None
Wildlife Habitat Capability						
% Reduction of Habitat Capability						
Sitka Black-tailed Deer	0	8	13	7	14	9
Level of Change	None	Minor	Minor	Minor	Minor	Minor
Brown Bear	0	5	9	5	9	7
Level of Change	None	Slight	Minor	Slight	Minor	Minor
Marten	0	9	14	7	14	9
Level of Change	None	Minor	Minor	Minor	Minor	Minor
River Otter	0	15	21	15	21	18
Level of Change	None	Minor	Moderate	Minor	Moderate	Minor
Hairy Woodpecker	0	9	17	8	16	11
Level of Change	None	Minor	Minor	Minor	Minor	Minor
Brown Creeper	0	11	18	9	17	11
Level of Change	None	Minor	Minor	Minor	Minor	Minor

Table 2-22 (continued)

Comparison of Environmental Consequences by Alternative

Environmental Consequence	Alternative A	B	C	D	E	F
Biological Diversity						
Fragmentation						
Reduction in Old-growth Forest Patches 500-1,000 Acres in Size (%)	0	4	14	3	15	4
Level of Change		Slight	Minor	Slight	Minor	Slight
Reduction in Old-growth Forest Patches >1,000 Acres in Size (%)	0	44	60	40	50	56
Level of Change		Substantial	Substantial	Substantial	Substantial	Substantial
Watershed and Fish						
Ratio of Road Miles per Watershed Area (mi./mi.^{2})	0	4.4	4.1	3.9	4.0	3.7
Ratio of Harvest Area to Watershed Area (in acres)	0	0.3	0.4	0.2	0.3	0.2
Sensitivity Rating	0	1.5	2.4	1.3	2.1	1.5
Level of Change	None	Slight	Slight	Slight	Slight	Slight
Marine						
Log Transfer Facilities						
Intertidal Habitat Affected (%)	0	<1	<1	<1	<1	<1
Level of Change	None	Slight	Slight	Slight	Slight	Slight
Subtidal Habitat Affected (%)	0	0.16	0.32	0.24	0.24	0.08
Level of Change	None	Slight	Slight	Slight	Slight	Slight
Log Raft Storage[1]						
Intertidal Habitat Affected (%)	<1	<1	<1	<1	<1	<1
Level of Change	None	None	None	None	None	None
Subtidal Habitat Affected (%)	0	<1	<1	<1	<1	<1
Level of Change	None	Slight	Slight	Slight	Slight	Slight
Recreation						
Change in Acres of ROS (%)						
Primitive	0	-67	-75	-75	-75	-75
Semiprimitive Nonmotorized	0	+47	+34	+48	+32	+46
Semiprimitive Motorized	0	-4	-9	-6	-7	-3
Roaded Natural	0	0	+5	0	+5	0
Roaded Modified	0	+24	+45	+33	+45	+32
Level of Change	None	Moderate	Substantial	Substantial	Substantial	Substantial

Table 2-22 (continued)
Comparison of Environmental Consequences

	Alternative					
Environmental Consequence	*A*	*B*	*C*	*D*	*E*	*F*
Visual Quality						
Decrease in Acres of Retention VQOs (%)	0	<1	3	2	2	<1
Decrease in Acres of Partial Retention VQO (%)	0	8	10	4	8	8
Decrease in Acres of Modification VQO (%)	0	5	7	3	7	5
Increase in Acres of Maximum Modification VQO (%)	0	41	76	34	67	41
Level of Change	None	Substantial	Substantial	Substantial	Substantial	Substantial
Land Ownership and Use						
Acres within a Selection Area	0	0	0	0	0	0
Roads in Selection Area	no	no	yes	yes	no	no
Acres within Private Land	0	0	0	0	0	0
Roads in Private Land	no	no	no	no	no	no
Cultural Resources						
Impacts to Known Cultural Resources	no	no	no	no	no	no
Socioeconomics						
Employment (number of jobs)	0	290	478	299	509	359
Employee compensation (millions $)	0	10.23	16.88	10.29	17.97	12.51
Contribution to Gross Regional Product (millions $)	0	15.53	25.61	15.78	27.28	19.05
Subsistence						
Significant Possibility of a Significant Restriction						
Deer	yes	yes	yes	yes	yes	yes
Furbearers	no	no	no	no	no	no
Fish and Shellfish	no	yes	yes	yes	yes	no
Marine Mammals	no	no	no	no	no	no
Brown Bear	no	no	no	no	no	no

[1] Log raft storage is presently occuring in Poison Cove and may occur in Ushk Bay independent of proposed harvesting within the Project Area.

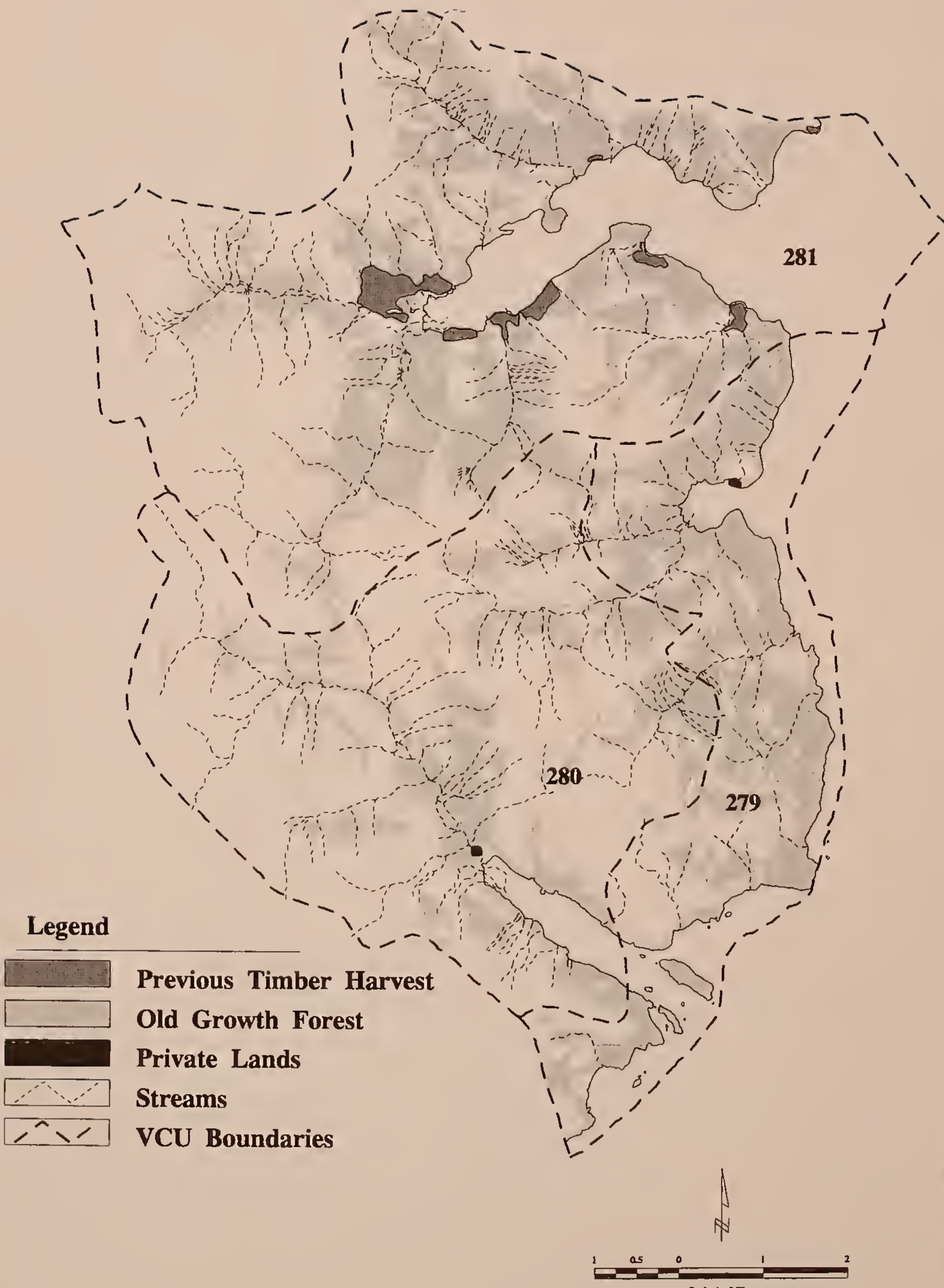


Figure 2-1
Alternative A

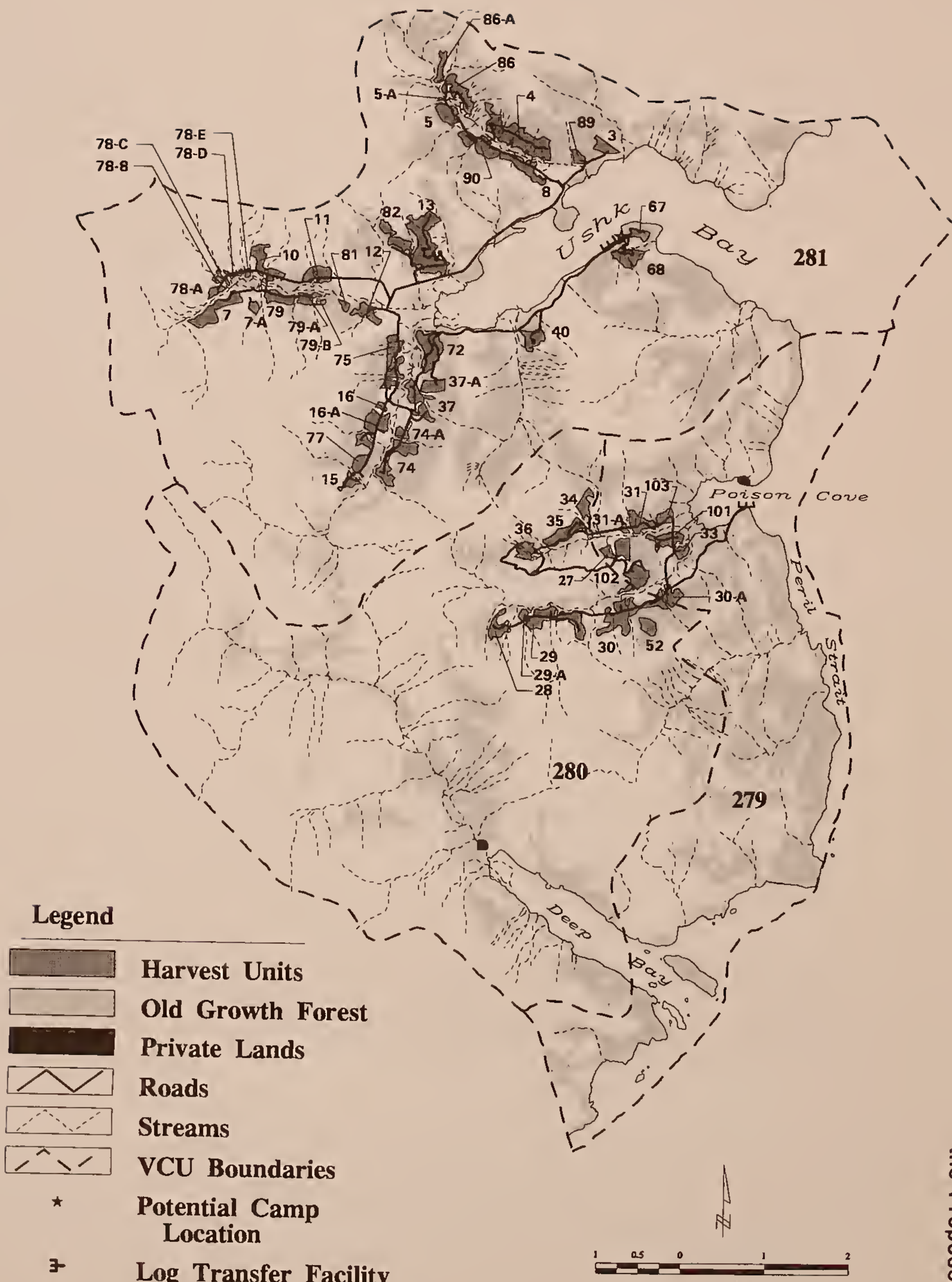
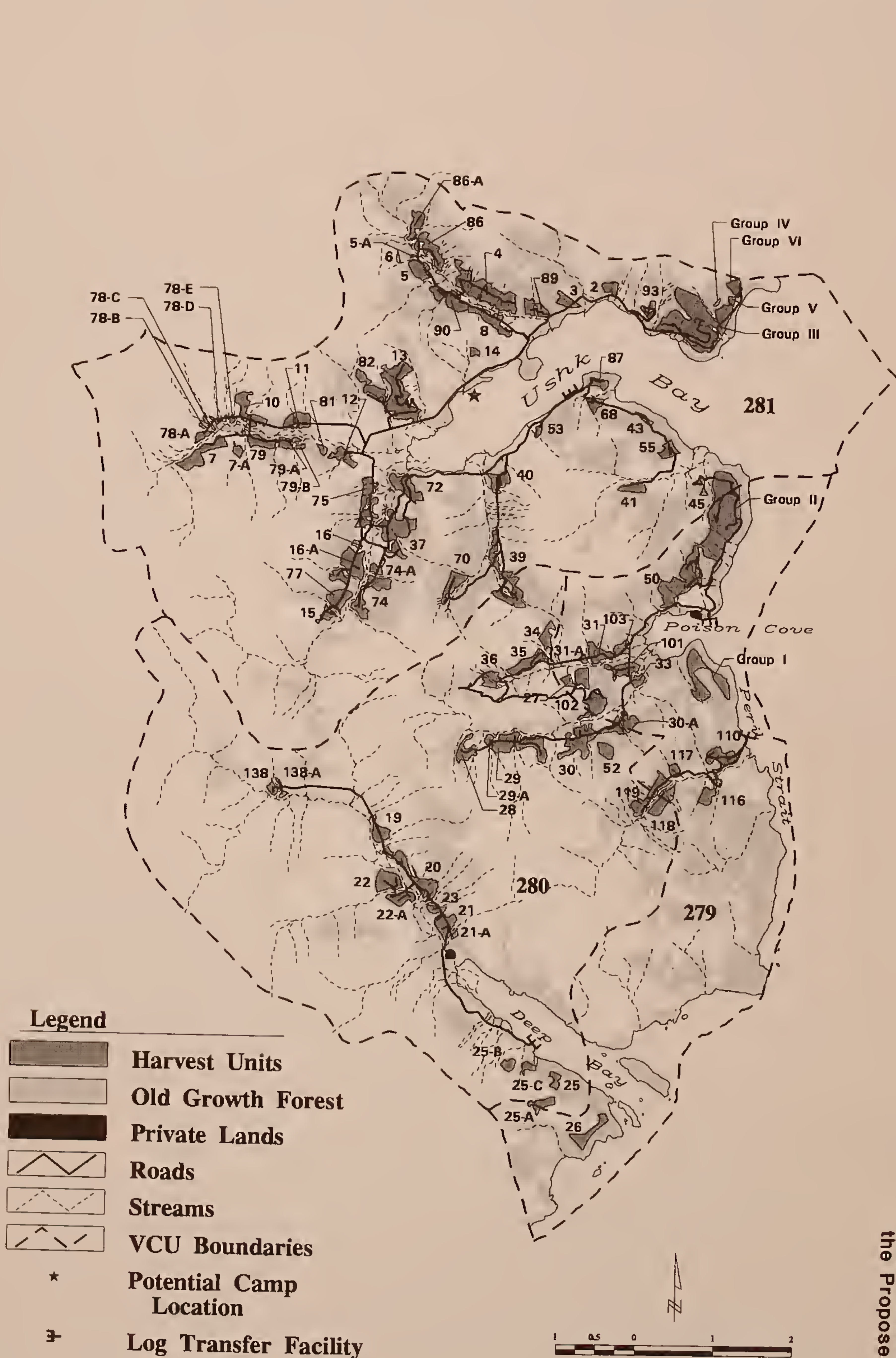


Figure 2-2
Alternative B


Ushk Bay
Poison Cove
Peril Strait
Deep Bay
281
280
279
Group IV
Group VI
Group V
Group III
Group II
Group I
86-A
86
5-A
6
5
4
89
3
2
93
90
8
14
87
78-C
78-B
78-E
78-D
11
82
13
10
81
12
78-A
7
7-A
79
79-A
79-B
75
72
40
53
68
43
55
41
45
16
16-A
77
37
74-A
74
15
70
39
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31
103
101
33
36
35
31-A
27
102
30-A
110
117
30
52
29
29-A
28
119
118
116
138
138-A
19
20
22
23
21
22-A
21-A
25-B
25-C
25
25-A
26
Legend
Harvest Units
Old Growth Forest
Private Lands
Roads
Streams
VCU Boundaries
Potential Camp Location
Log Transfer Facility
1
0.5
0
1
2
Scale in Miles

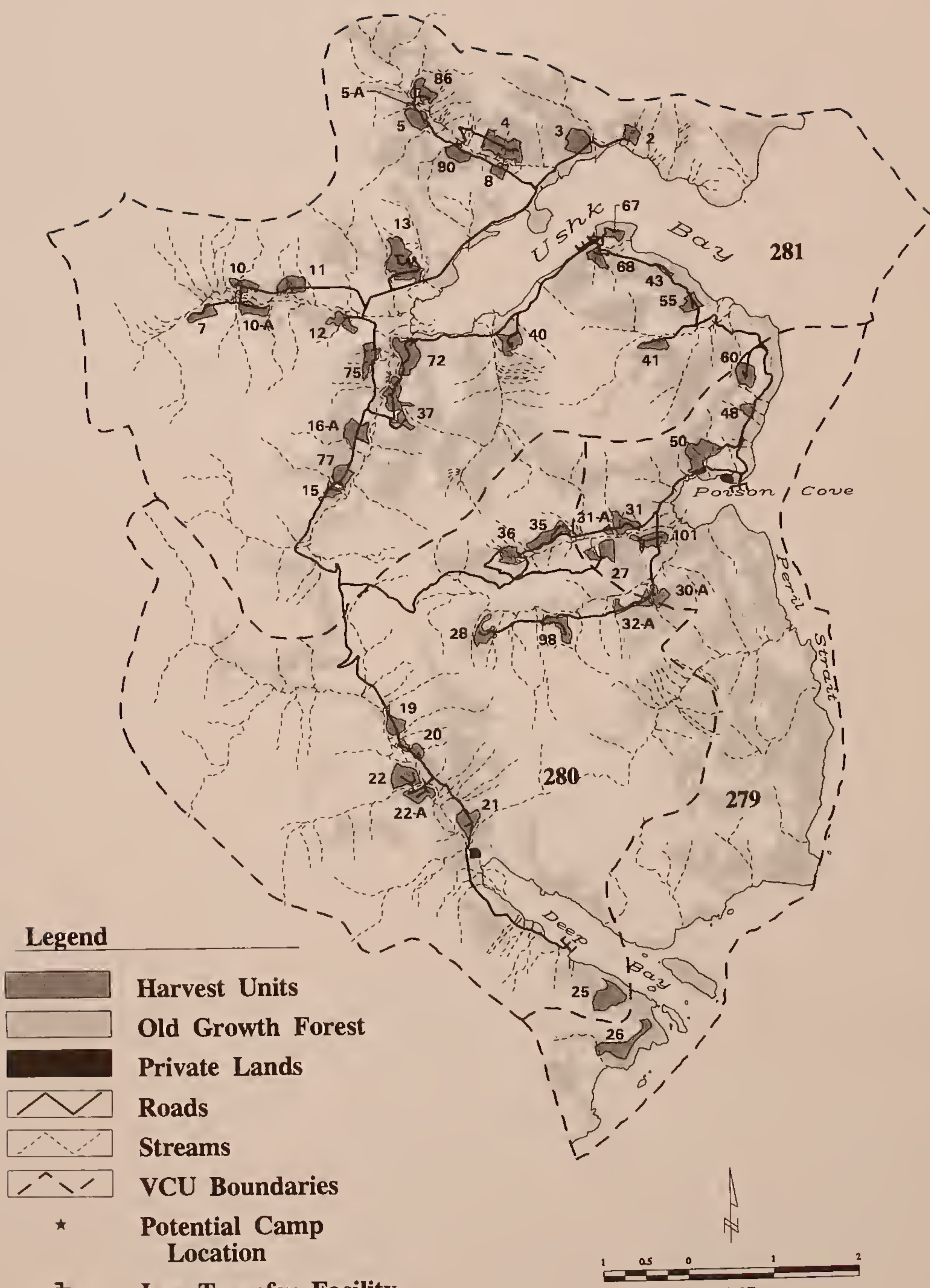


Figure 2-4
Alternative D

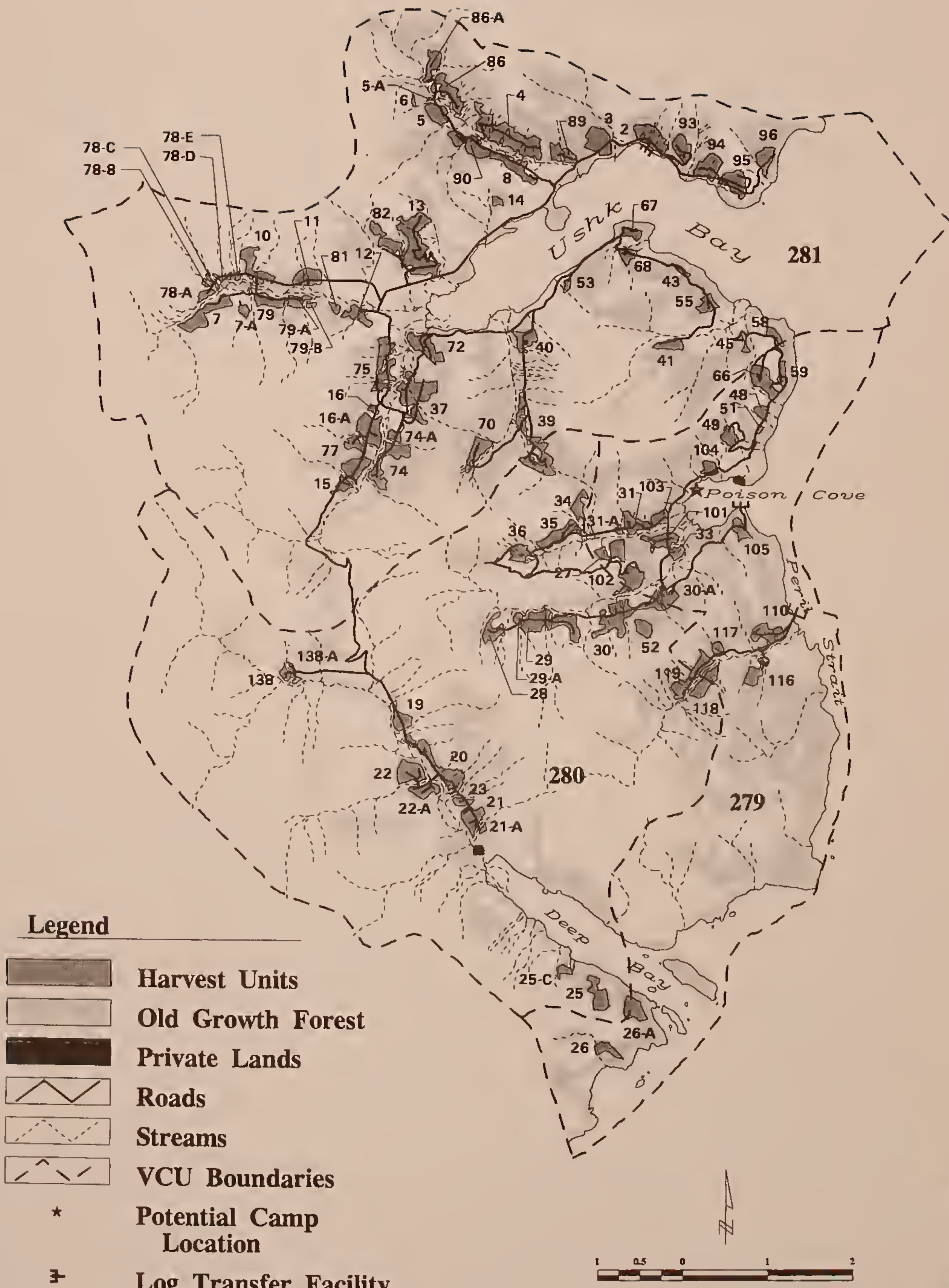


Figure 2-5
Alternative E

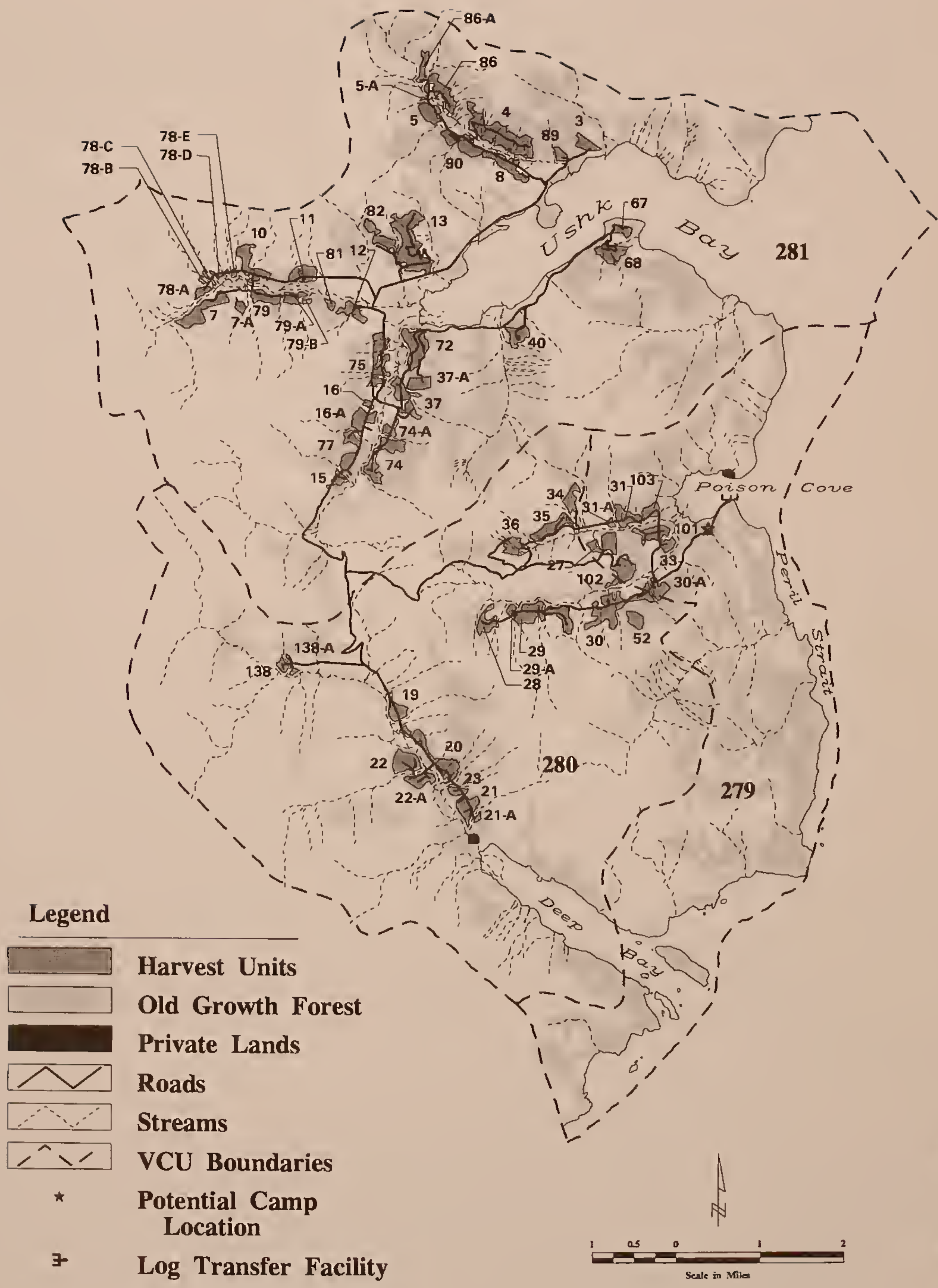


Figure 2-6
Alternative F

Chapter 3
Affected Environment

Chapter 3
Affected Environment

This chapter provides information about the existing environment of the Ushk Bay Project Area that may be affected by implementing any of the alternatives described in Chapter 2. Discussions include aspects of the physical, biological, cultural, economic, and social environments that may be affected. This information is used in Chapter 4 to evaluate the effects of changes in the environment under the various project alternatives for the proposed timber harvest. The Ushk Bay Project Area is designated, by management decisions made in the Tongass Land Management Plan (TLMP) and its amendments, to be managed for resource use and development (i.e. timber harvest) and for other amenities. Resource use and development will necessarily alter the environment for both the short term and the long term.

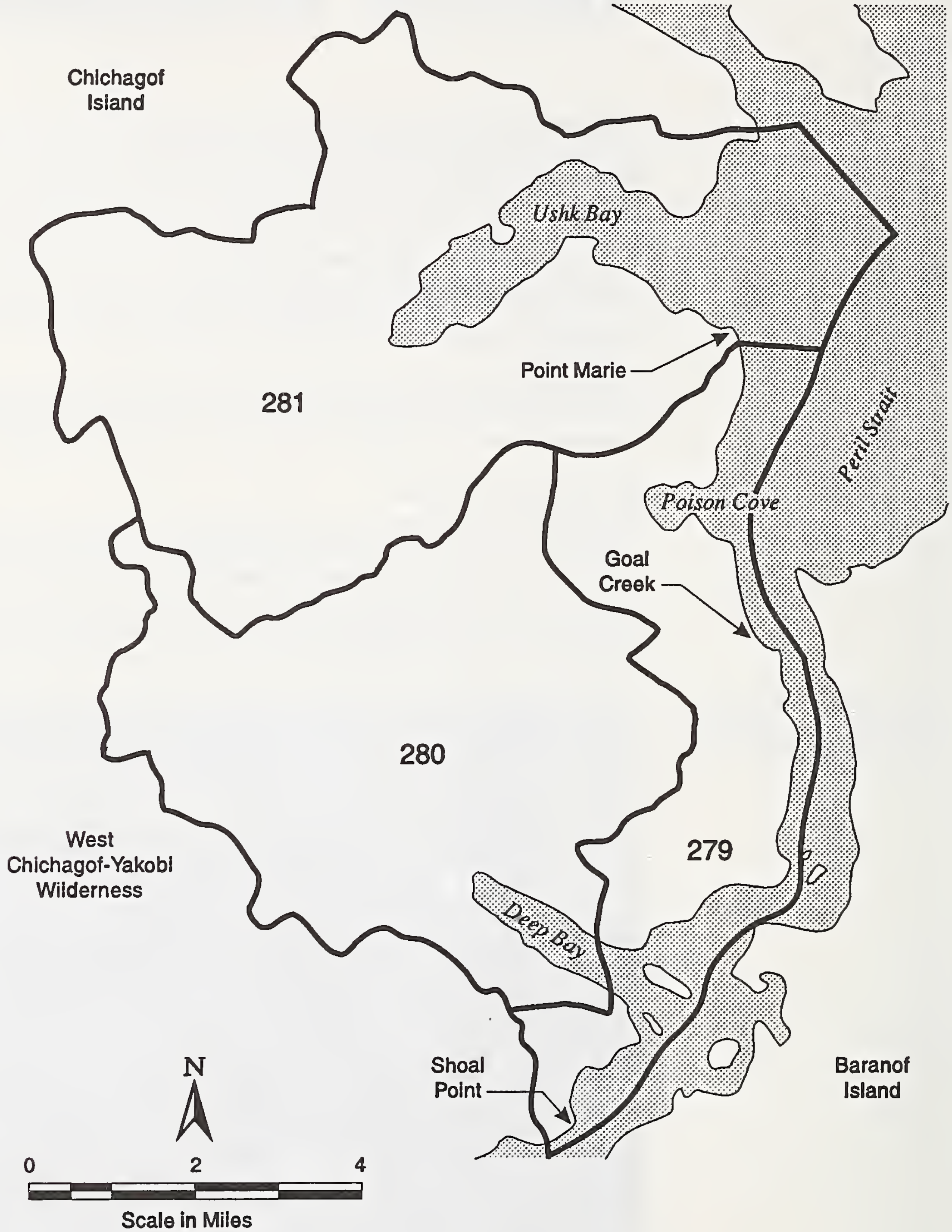
The Ushk Bay Project Area contains a total of 44,503 acres encompassing three Value Comparison Units (VCUs). The setting of each VCU is described below to orient the reader for the resource descriptions that follow. Key locations are shown on Figure 3-1.

VCU 279 (Poison Cove)

This VCU borders on the west side of Peril Strait and extends from Point Marie at the south side of the entrance to Ushk Bay southward to Shoal Point, south of Deep Bay (Figure 3-1). The VCU includes the steep slope facing Peril Strait, the foreground views of the Poison Cove drainage and the mouth of Deep Bay, and Goal Creek and several smaller, unnamed drainages between them. Two creeks entering Poison Cove are the largest streams in the VCU. Elevations of the peaks along the interior border of this VCU range from about 1,200 to nearly 2,300 feet.

The ecosystems of Southeast Alaska vary greatly from seashore to mountain top.

Figure 3-1
Ushk Bay Project Area



Treeline is roughly 1,000 feet in elevation. The scene viewed from Peril Strait includes heavily forested lower slopes with rocky peaks extending above. This scene is typical of landscapes throughout coastal Southeast Alaska. There are no roads or trails, and the only signs of human use are the log rafts commonly stored in Poison Cove and an old cabin on a small private parcel on the north shore of Poison Cove.

In the TLMP, both the high commodity value and the other amenity values of this VCU were recognized. A key amenity value is its visibility to the Alaska Marine Highway (the ferry route). Because of the combination of values, this VCU was designated as a Land Use Designation (LUD) III. Therefore, management planning guidelines for this VCU includes reducing the potential timber harvest to protect the amenity values.

VCU 280 (Deep Bay)

The drainages tributary to Deep Bay comprise the majority of VCU 280 (Figure 3-1). In addition, the upper parts of the Goal Creek and Poison Cove drainages are included. The southwestern border of this VCU is the crest of the divide that is also the boundary of the West Chichagof - Yakobi Wilderness. The highest elevation along the border is 2,380 feet. The main stream in the VCU is Deep Creek. The Deep Creek valley is a rounded glacially carved valley. The bottom of the valley and both slopes facing Deep Bay are heavily forested.

The upper elevations are dominated by rock outcrops or muskegs, open boggy areas, often with scattered, stunted trees. The VCU has no roads or trails, and the signs of human presence include a small cabin at the head of the bay on a parcel of private land and an occasional recreational boat in the bay. The landscape as viewed from Deep Bay is also of a forested foreground and a mountainous background.

The TLMP designated VCU 280 as LUD IV, to be managed for commodity production (i.e., timber harvest). These areas have no particular restrictions on timber harvest beyond the standards and guidelines and require best management practices that apply to all harvest areas.

VCU 281 (Ushk Bay)

Ushk Bay and the watersheds that are tributary to it comprise VCU 281 (Figure 3-1). On the south it borders VCU 280 (Deep Bay) at the muskeg saddle that separates the two watersheds and VCU 279 along the ridge top west of Point Marie. On the west, VCU 281 also borders the West Chichagof - Yakobi Wilderness, and the highest peak along that part of the crest of the divide is 2,554 feet. The northern boundary is also along the crest of a divide between watersheds. Peaks of the crest range from about 1,600 to 2,290 feet. The Ushk Bay watershed is comprised of four main valleys and several smaller drainages. At the head of the Bay, the largest valley extends directly westward. Two valleys extend to the south, and one angles to the northwest from the bend in the Bay. Streams from two drainages empty into Ushk Bay near its mouth on the south side.

Signs of past human use are visible in this VCU. Several patches of timber have been harvested near the beach and are now heavily stocked stands of young trees. There are no open or driveable roads or trails in the VCU, but the pattern of alder growth in an old clearcut at the head of Ushk Bay clearly marks where the roads for that harvest were in the bottom of the valley. Ushk Bay is a fairly popular anchorage, and it is common to find recreational boats or fishing boats, especially during the summer. Dungeness crabs are harvested commercially, and the buoys and boats are visible during the commercial season. The landscape views from Ushk Bay are only somewhat modified by the past timber harvest. The scenes are primarily forested foreground and mountainous background. Two patches of timber that have been blown down by storms also change the view locally.

The TLMP also designated VCU 281 as LUD IV, to be managed for commodity production (i.e., timber harvest). It therefore has no additional restrictions on timber harvest beyond the standards and guidelines and required best management practices that apply to all harvest areas.

3 Affected Environment

Old-growth forest that is important for timber harvest as well as non-commodity values.

Timber

Western hemlock and Sitka spruce dominate timber stands throughout the Ushk Bay Project Area. Other timber species include mountain hemlock, lodgepole pine, red alder, and Alaska-cedar (also known as yellow-cedar).

Western hemlock and Sitka spruce develop best on well-drained valley bottoms and lower slopes; however, they also occur anywhere between sea level and timberline. Both species are harvested for commercial purposes. Alaska-cedar occurs in limited numbers in stands throughout the area and is a highly valued commercial species. Lodgepole pine (also called shore pine) is usually considered a commercial species but is rarely harvested in Southeastern Alaska because it does not meet merchantability standards. The major noncommercial species is red alder, commonly found along beaches and streams and on steeper slopes where soils have been disturbed, such as by landslides.

Most of the commercial forest land in the Project Area is considered mature or overmature. These stands are also commonly referred to as climax plant communities or old-growth forests. Although most of the timber in old-growth forests is of declining commercial quality, it is suitable for the production of pulp and lumber.

Mature and overmature stands have an uneven appearance because they contain trees of many ages and sizes, with many dead tops and snags. In contrast, stands that have been disturbed during the last 100 to 200 years by fire, landslide, windthrow, or logging have a more uniform appearance because they contain trees of relatively uniform age and size with fewer snags and defective trees. Even-aged stands convert as mortality occurs due to insects, disease, wind, snow, and ice. This opens up stands for new growth to occur. This change in stands is a continuing process. Harvested, mature stands are returned to even-aged stands as they regenerate (Harris and Farr 1974).

Commercial Forest Land

Of the 44,503 total land acres in the Ushk Bay Project Area, 9,929 acres are classified as non-forested, 17,643 acres are classified as forest land, low productivity (non-commercial forest land), and 16,931 acres are considered productive, or commercial forest land. Table 3-1 shows the breakdown of these acres, by VCU, for the Ushk Bay Project Area.

Volume Class Distribution

Commercial forest land (CFL) in the Tongass National Forest has been classified into five volume classes. Each Volume Class represents a range of timber volume per acre. Volume Class 3 includes CFL containing less than 8 thousand board feet (MBF)/acre net sawlog volume. Volume Classes 4 through 7 include merchantable-size timber with a volume of 8 MBF per acre or greater, as displayed in Table 3-2. All of the acreages stated in this section are based on the GIS Timber Type data layer for the Chatham Area.

Of the 16,931 acres of CFL, 16,324 acres are in volume classes 4, 5, or 6. The remaining 607 acres are productive sites that currently have less than 8 MBF/acre because of earlier timber harvest or blowdown. No volume class 7 has been identified in this Project Area. Table 3-3 shows acres, by volume class, by VCU, for the Ushk Bay Project Area.

Timber Species Distribution

Western hemlock, Sitka spruce, and Alaska-cedar are the major commercial tree species found in the Ushk Bay Project Area. The only other species found in the Project Area are mountain hemlock and an insignificant amount of lodgepole (shore) pine. Red alder is the major non-commercial species in the Project Area. Table 3-4 shows the acres in each Forest Type, by VCU, for the Project Area.

Table 3-1.
Acres by Land Classification by VCU

VCU	Non-Forested Land	Non-Commercial Forest Land	Commercial Forest Land	Total
279	246	2,853	4,407	7,506
280	4,451	8,070	4,175	16,696
281	5,232	6,720	8,349	20,301
Total	9,929	17,643	16,931	44,503
Percent of Total	22.3	39.6	38.1	100.0

Source: Smith and Johnson, 1992

Table 3-2.
Range of Timber per Acre by Volume Class

Volume Class	Range of Volume (MBF/Acre)[1]
4	8 - 20
5	20 - 30
6	30 - 50
7	greater than 50

Source: USDA Forest Service, 1979
1 Net sawlog volume

Yellow cedar is a valuable component of spruce and hemlock forest types.

Table 3-3.
Acres by Volume Class by VCU

VCU	Volume Class 4	5	6	7	Totals Acres	%
279	2,871	1,401	55	0	4,327	26.5
280	2,746	1,239	172	0	4,157	25.5
281	4,282	3,393	165	0	7,840	48.0
Totals	9,899	6,033	392	0	16,324	100.0

Source: Smith and Johnson, 1992

Table 3-4.
Acres by Forest Type by VCU

VCU	Hemlock	Spruce	Hemlock Spruce	Alder	Totals
279	1,364	206	2,837	0	4,407
280	924	112	3,139	0	4,175
281	1,134	272	6,938	5	8,349
Total	3,422	590	12,914	5	16,931

Source: Smith and Johnson, 1992

Western hemlock and Sitka spruce can occur anywhere between sea level and timberline, but they grow best on well-drained valley bottoms and lower slopes. Western hemlock is the predominant species in most lower elevation stands. The Sitka spruce types generally occur in the colluvial soils of the valley bottoms. At higher elevations, western hemlock is mainly replaced by mountain hemlock. Mountain hemlock is also found at lower elevations, generally on poorer sites on land fringing muskegs. Alaska-cedar may be found from sea level to timberline. It can be found in nearly pure stands or in a mixture with western and mountain hemlocks and Sitka spruce. It grows best on well-drained sites, but has difficulty competing with western hemlock and Sitka spruce on these sites. Alaska-cedar is found predominantly on poorer sites which are poorly drained, often over hardpan, and on shallow soils over bedrock. Red alder is commonly found along beaches and streams, and on lands that have been recently disturbed, such as landings and roads (Ruth and Harris 1979).

Timber Size Class Distribution

Commercial forest land is classified into four timber size classes, based on tree size and age. They are as follows:

Symbol	Timber Size Class	Description
1	Seedling & Sapling	0" to 4.9" dbh (diameter at breast height)
2	Pole Timber	5" to 8.9" dbh
3	Young-growth sawtimber	9" + dbh & <150 years old
4	Old-growth sawtimber	9" + dbh & >150 years old

Most of the commercial forest land in the Ushk Bay Project Area has not been previously harvested or recently disturbed and is classified as Size Class 4. These forests are mature and over-mature climax plant communities, and are considered old-growth forests. It is realized the definition of "old-growth" forests includes items other than age and size. They are ecosystems distinguished by old trees and related structural attributes. Old-growth forests encompass the latter stages of stand development and typically differ from earlier stages of stand development in a variety of characteristics that may include tree size, accumulation of large dead woody material, number of canopy layers and tree species composition, and ecosystem function (USDA Forest Service 1991c). The distribution of stand size classes by VCU is given in Table 3-5.

Other characteristics of the Size Class 4 stands are as follows:

- They are assumed to have reached an equilibrium where timber growth equals mortality.
- Generally they contain considerable defect, but also provide good quality timber for lumber production and good residual wood for pulp production.

Table 3-5.

Acres by Timber Size Class by VCU

VCU	Size Class 1	2	3	4	Totals
279	3	14	25	4,365	4,407
280	0	0	0	4,175	4,175
281	366	83	28	7,872	8,349
Total	369	97	53	16,412	16,931

Source: Smith and Johnson, 1992

Tentatively Suitable Forest Land

Commercial forest land is further classified as tentatively suitable or not tentatively suitable for timber harvest. Tentatively suitable forest lands are those identified as having the biological capability and availability to produce industrial wood products. To be considered suitable, the commercial forest land must:

- Be capable of harvest with available technology to ensure timber production without irreversible resource damage to soil productivity or watershed conditions;
- Have a reasonable assurance that the area can be restocked within 5 years after harvest; and
- Not be withdrawn from timber production by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service.

The resultant tentatively suitable area is summarized by volume class and VCU in Table 3-6.

Past Harvest and Silvicultural Treatment Activity

There were some harvest activities under the APC Long-Term Timber Sale Contract within the project area. Eight units, comprising approximately 321 acres, were harvested between 1956 and 1966 in VCU 281 (all but 12 acres occurred between 1963 and 1966) using the clearcut harvesting method. Some of the harvest units were apparently logged directly into Ushk Bay and Peril Strait using A-Frame systems. The large clear cut located at the west end of Ushk Bay along the north shore of West Ushk Creek, was harvested utilizing a now abandoned road sys-

Table 3-6

Acres of Tentatively Suitable Forest Land by Volume Class and VCU

VCU	Volume Class 4	5	6	7	Total
279	2,202	1,102	18	0	3,322
280	1,507	620	63	0	2,190
281	2,710	1,931	101	0	4,742
Total	6,419	3,653	182	0	10,254

Source: Smith and Johnson, 1992.

tem that terminated in an old LTF at the end of the Bay. There were no Long-Term Timber Sale harvesting activities in the other VCU's. However, there have been some harvesting activities in the Project Area prior to the APC contract. Many of the alluvial bottomlands along the main creeks were selectively logged for Sitka spruce, probably during the two world wars. There are no available records as to precisely when this old harvesting occurred or how many acres were involved.

Reforestation is the process of establishing a new crop of trees on harvested units. All harvested units must meet or surpass stocking guidelines within the 5-year regeneration period established by law (USDA Forest Service 1991c). A silviculturist must certify that a unit is adequately stocked with desirable tree species within the five year period following harvest. Reforestation can be accomplished by natural seeding from surrounding timber stands or by planting. Natural regeneration is the method of choice in Southeast Alaska and usually produces satisfactory results. However, there are situations where hand planting may be necessary or desirable. Examples include when a natural source of seed for a desired species is inadequate to maintain a timber stand's current species composition, or when it is desirable to reduce the time needed for natural regeneration. All of the previous harvest units within the Ushk Bay Project Area have restocked with natural regeneration.

Natural regeneration often results in overstocked stands and necessitates a pre-commercial thinning in order to facilitate growth. Thinning is the systematic regulation of growing stock in a young forest. Trees are removed in young stands (usually at around age 15 to 30) to stimulate growth of the remaining trees and to increase financial return (Ruth and Harris 1979). Thinning also may be done to control species composition, improve genetic composition, increase windfirmness, or for other purposes. None of the previously harvested units within the Ushk Bay Project Area have been thinned. The natural regeneration on these units is now approximately 22 to 28 years old and is pre-commercial thinning age.

Table 3-7 displays the acres of regeneration and regeneration certification that has occurred in the Ushk Bay Project Area. All of the previously harvested areas have been certified as adequately stocked.

Windthrow Hazard

Wind damage is prevalent in timber stands throughout Southeast Alaska. Each year high winds sweep through the forests and cause considerable damage. One study indicated that wind was responsible for approximately one-fourth of the annual tree mortality in Southeast Alaska during a seven year period (Hutchison and LaBau 1975).

Table 3-7.
Acres of Natural Regeneration on Past Harvesting Units in VCU 281

Stand No.	Acres	Year Harvested	Year Certified
373	12	1956	1970
250	28	1963	1967
87	95	1964	1967
208	42	1965	1970
197	30	1966	1970
212	60	1966	1970
396	17	1966	1971
226	37	1966	1970
Total	321		

Source: Smith and Johnson, 1992

Although forest managers probably will never be able to eliminate wind damage completely, there is a lot they can do to reduce or minimize damage (Harris 1989). Undisturbed forest watersheds are generally less likely to suffer windthrow damage than watersheds in which harvesting has taken place. Undisturbed timber stands have reached a certain degree of wind stability and tend to rely on each other to keep the main force of the wind above the forest canopy. However, once a stand is opened up through harvesting or natural factors, the wind is able to exert its full force against an edge of the stand, which becomes more susceptible to damage. The number of acres for each windthrow risk rating is summarized, by VCU, in Table 3-8.

Storm winds topple trees creating openings soon to be filled with new forest growth.

Table 3-8.
Windthrow Risk Ratings
(Acres by VCU for Volume Classes 4, 5, and 6 only)

VCU	Windthrow Risk Ratings *Low*	*Med*	*High*
279	150	2,178	2,062
280	1,803	1,928	444
281	2,215	4,249	1,436
Total	4,168	8,355	3,942

Source: Smith and Johnson, 1992

Insect, Disease, and Animal Damage

As living organisms, trees are subject to aging and eventual death. These are natural processes in the renewal and continuation of the forest. Various living and non-living agents, including insects, disease, and animals, alter the natural aging and death process of trees and stands (Ruth and Harris 1979). The most prevalent damaging agents are discussed below.

Dwarf Mistletoe

The occurrence of dwarf mistletoe in mature and over-mature western hemlock stands is widespread throughout Southeast Alaska and the Ushk Bay Project Area. It is one of the most destructive diseases in old-growth forests of Southeast Alaska. In general, dwarf mistletoe reduces the vigor and growth rate of their hosts so that infected trees require a longer time to mature and often produce a lower quality of timber (Boyce 1961). Dwarf mistletoe often produces cankerous swellings at the point of infection of limbs or main stems. The cankers offer an entrance for wood-destroying fungi which can lead to significant heart rot.

Dwarf mistletoe is prevalent throughout the Project Area and may be one of the agents responsible for the high incidence of heart rot in over-mature hemlock stands. However, only a few high concentration areas were observed, as evidenced by heavy brooming. These areas are located primarily in VCU 281 north of Ushk Bay.

Hemlock Fluting

Fluting is the presence of deep vertical grooves in the main stem of western hemlock. It is a problem in that the bark becomes ingrown and the volume of merchantable wood is considerably reduced. Some second growth stands are so badly fluted that there is no merchantable value in the hemlock component. The cause of hemlock fluting is unknown (Ruth and Harris 1979).

There is some hemlock fluting within the Ushk Bay Project Area, but it is not considered a serious problem.

Alaska-Cedar Decline

Alaska-cedar decline is an affliction which causes considerable mortality of Alaska-cedar in southeastern Alaska. Mortality can be in small patches or expansive areas. Affected cedars may die quickly (over 2 or 3 years), or may die slowly over a 15 year period or longer with crowns slowly thinning. The cause of Alaska-cedar decline is not completely understood, but is generally associated with boggy conditions, usually near muskegs (Holsten et al. 1985). The primary cause of mortality is unknown, and no single factor has been shown to be primarily responsible for tree death (Hennon et al. 1990).

There is a considerable number of afflicted Alaska-cedar stands within the Ushk Bay Project Area. Many of these stands were not part of the suitable land base (less than 8 MBF per acre) and, therefore, were not examined.

Cedar Stripping

The stripping of bark on Alaska-cedar trees is a fairly common occurrence in the Ushk Bay Project Area. The stripping is often caused by the Alaska brown bear and damage is usually light. Normally the trees survive (Ruth and Harris 1979). This is not considered a serious problem in the Project Area.

Decay Fungi

Decay caused by heart- and root-rotting fungi is probably the greatest single cause of disease-related volume loss in Alaska (Holsten et al. 1985), and probably also within the Project Area. In many old-growth stands, annual volume loss of wood through decay may equal or exceed growth. On average, only about 31 percent of the gross board foot volume in old-growth stands is estimated to be usable as sawtimber (Ruth and Harris 1979). Some of the decay-causing fungi within the Project Area are: *Fomes pinicola* (brown rot fungus of Sitka spruce and western hemlock); *Armillaria mellea* (white rot fungus of Southeast Alaska conifers); and *Fomes annosus* (white rot fungus of western hemlock and Sitka spruce).

Site Productivity

Site Productivity, or Site Class, is an indicator of the productivity of a particular forest site. Knowledge of the productivity is important in predicting future yields and to assist the forest manager in setting silvicultural priorities.

There are several accepted methods for determining a site index. One method is based on the height and age of trees in a stand. An index age of 50 or 100 years is usually used in constructing height-age site curves and the site index is the height of trees at the index age. This system does not work well for old-growth timber stands. It is difficult to measure age accurately and trees over 300 years old virtually cease height growth.

A second method is a soil-based system. Estimates of site productivity in old-growth stands can best be obtained from examination of the soil. Soil-site relationships have been developed for Southeast Alaska, based primarily on depth and drainage of soil and parent material (Ruth and Harris 1979). These Site Indices (Table 3-9) have been divided into four site classes and incorporated into a data layer in the Forest Plan data base. Site Class 1 is the least productive, while Site Classes 4 and 5 are the most productive. Table 3-10 displays the acres of land by Site Class. Site Class 1 is the most prevalent Site Class in the Ushk Bay Project Area.

Table 3-9.
Site Indices

Site Class	Site Index
1	0 to 40
2	41 to 60
3	61 to 80
4 & 5	80 plus

Source: Smith and Johnson, 1992.

Table 3-10
Acres by Site Class by VCU

VCU	Site Class 1	2	3	4 and 5
279	2,614	922	2,160	1,810
280	9,441	3,152	3,356	1,747
281	9,223	2,459	5,127	3,492
Total	21,278	5,533	10,643	7,049
Percent of Total	48	12	24	16

Vegetation

The natural vegetation of the Ushk Bay Project Area is a mosaic of coniferous forest interspersed with alpine meadow, alpine lichen, muskeg (bog), shrubland, and estuarine plant communities.

Vegetation in the Ushk Bay Project Area has been classified into plant associations. These plant associations are based upon the climax plant community. The climax plant community is the result of the interaction between landform, climate, and soils over long periods of time. All plant associations having the same climax tree(s) are referred to as a series and are named based upon the climax tree(s).

Forested Plant Series

There are four dominant forested plant series in the Ushk Bay Project Area. The following series descriptions are based upon Martin (1989).

Western Hemlock Series

Plant associations in this series generally occur in the uplands on mountains, hills, and footslopes with moderate to well-drained soils. The predominant overstory tree species is the western hemlock, but Sitka spruce does occur in the overstory as a minor component. The shrub layer is dominated by blueberry and rusty menziesia; however, devil's club can be a major component in some areas. Bunchberry and five-leaf bramble dominate the herb layer, but skunk cabbage can be a major component in areas with seasonally wet soils. Plant productivity is generally high, with mature hemlock often exceeding heights of 100 feet.

Copperbush.

Sitka Spruce Series

Plant associations in this series are generally associated with riparian areas and other disturbed sites such as stringers between avalanche chutes. This series occurs predominantly on warmer sites at lower elevations. Sitka spruce is the dominant overstory tree species but western hemlock can be a co-dominant. Other tree species such as mountain hemlock, Alaska-cedar, and shore pine rarely occur. Dominant shrub species include alder, devil's club and blueberry, with salmonberry occurring to a lesser degree. Ferns and skunk cabbage are the dominant herbs. This series is generally highly productive, with heights of mature spruce often exceeding 125 feet.

Mixed Conifer Series

These plant associations generally occur in the uplands, often near muskegs. Dominant overstory tree species are mountain hemlock, western hemlock, and Alaska-cedar. Sitka spruce and shore pine can occur but are minor components where present. Blueberry and rusty menziesia are the dominant shrub species. Dominant herbs vary and include skunk cabbage, five-leaf bramble, deer cabbage, and ferns. Plant productivity is primarily limited by poor soil drainage.

Mountain Hemlock Series

These plant associations are generally found on cold high elevation sites above the western hemlock series. Mountain hemlock is the dominant overstory tree species with Sitka spruce and Alaska-cedar occurring to a lesser degree. The shrub layer is dominated by blueberry, and copper bush and cassiope also occur. Deer cabbage and five-leaf bramble are the dominant herbs. Plant productivity is limited by the shorter growing season at high elevations and by reduced soil drainage common to some of the associations.

Table 3-11 displays the percent of area by VCU occupied by each forested plant series found in the Ushk Bay Project Area.

Table 3-11.
Acres (and Percent) of Project Area Occupied by Forested Plant Series by VCU

Forested Plant Association	Acres per VCU 279	280	281	Total Acres (percent)
Western Hemlock Series	3,467	3,141	5,003	11,611 (26)
Sitka Spruce Series	360	885	1,795	3,040 (7)
Mixed Conifer Series	692	991	632	2,315 (4)
Mountain Hemlock Series	245	831	1,353	2,429 (6)

Source: Confer, 1992

Non-Forested Plant Associations

In addition to the forested plant associations, there are also five major non-forested plant communities found in the Ushk Bay Project Area. Various non-forested plant communities occur in riparian areas, muskegs, alpine meadows, and lacustrine areas. A short description of each follows. These descriptions are from DeMeo (1988). Table 3-12 displays the percentages of total land area occupied by each of these non-forested plant communities in the Project Area.

Alpine Lichen-Rock Outcrop

Alpine lichen rock outcrops are found at high elevations above timberline. Plant cover does not exceed 50 percent. Species diversity is high and includes cassiope, clubmoss, and grass species.

Alpine Meadow

Alpine meadows are dominated by cassiope and mixed forbs including mountain heather and deer cabbage. These meadows are found on steep, well-drained rock outcrops at high elevations.

Scrub-Shrub Riparian

Scrub-shrub riparian areas are found on highly active floodplains and are frequently disturbed. Soils are generally deep and well drained, but with high water tables. Salmonberry, stink currant, devil's club and ferns are the dominant vegetation. Willow and cottonwood are occasionally found in floodplains. These willow and cottonwood plant communities do not occupy a large area and are rare on the islands of the Chatham Area.

Emergent Mixed Forb/Grassland (not normal tide)

Emergent mixed forb/grasslands are associated with estuary tidal flats. These are found in sloughs, terraces between estuary channels, and mid-level estuary terraces. Vegetation consists primarily of red fescue, seashore plantain, and beach rye.

Table 3-12.

Acres (and Percent) of Project Area Occupied by Non-Forested Plant Series by VCU

Non-Forested Plant Series[1]	Acres by VCU 279	280	281	Total Acres (Percent)
Alpine Lichen-Rock Outcrop	0	1,410	925	2,335 (5)
Alpine Meadow	508	4,084	4,840	9,432 (21)
Scrub-Shrub Riparian	460	1,527	2,886	4,873 (11)
Emergent Mixed Forb/Grassland (not normal tide)	0	20	33	53 (<1)
Subtidal Unconsolidated (unvegetated mudflats)	22	0	21	43 (<1)
Emergent Estuary Sedge Tidal Flat	13	8	0	21 (<1)
Lacustrine	0	57	0	57 (<1)
Emergent Sphagnum Peat Muskeg	1,737	3,719	2,621	8,077 (18)

Source: Confer, 1992

[1] These acreages are derived from other data and may include a substantial amount of non-commercial forest.

Subtidal Unconsolidated (unvegetated mudflats)

Unvegetated mudflats are usually inundated by tides. They are only exposed during low tides and are devoid of rooted vegetation.

Emergent Estuary Sedge Tidal Flat

Estuary tidal flats are inundated by high tides. These are found in sloughs, terraces between estuary channels, and mid-level estuary terraces. Vegetation consists primarily of Lyngbye's sedge, red fescue, and sea milkwort. On low terraces, which are rarely inundated by tides but have high water tables, bluejoint and Lyngbye's sedge dominate. Soils are poorly drained.

Lacustrine

Lacustrine areas include wetlands and deepwater habitats situated in topographic depressions or dammed stream channels, having less than 30 percent areal coverage of vegetation, and exceeding 20 acres in size (Cowardin et al. 1979). Vegetation consists primarily of sedge, few-flowered shooting-star, and round-leaf sundew.

Emergent Sphagnum Peat Muskeg

Muskegs are dominated by sphagnum moss and sedges. Trees and shrubs are rare. The water table is at the surface and numerous small ponds are scattered throughout the muskegs.

Several wetland types occur in the Ushk Bay Project Area, including forested, estuarine, muskeg, alpine meadow, and lacustrine. Though riparian areas do not necessarily qualify as wetlands, they share many of the habitat qualities of wetlands or contain wetlands and so are also discussed here. Plant series that have a major wetland component occupy 87 percent of the total Ushk Bay land area. Forested wetlands occur predominantly in two forested plant series, western hemlock and mixed conifer. Estuarine wetlands are found along the shorelines of Ushk and Deep Bays, and Poison Cove, generally associated with the mouth of streams. Estuarine wetlands include emergent mixed forb/grassland, subtidal unconsolidated, and emergent estuary sedge tidal flat. Muskegs are the most common wetland type in the Ushk Bay area with 18 percent of the total area. These wetlands are generally found at moderate elevations on slopes and on terraces above rivers at various elevations. Muskegs are generally nonforested, but often contain stunted trees or the edge of forested areas. Alpine meadow wetlands are found at high elevations, generally above timberline. One lacustrine (lake) wetland was identified within the Ushk Bay area. This lacustrine area is at high elevation associated with muskeg wetlands. Riparian areas are associated with water courses and are generally dominated by the Sitka spruce/blueberry-devil's club forested plant association or by the scrub-shrub riparian non-forested plant association.

Socially significant functions associated with wetlands identified in the Ushk Bay area include water quality improvement, floodflow alteration, biological support, and groundwater recharge/discharge. Values are based on the effectiveness and opportunity wetlands have to perform each function. The functional values for each wetland type are summarized in Table 3-13.

Threatened and Endangered Plant Species

None of the Federally listed threatened or endangered plant species are known to exist in the Ushk Bay Project Area. Of the 22 species of plants on the Alaska Region Sensitive Species List (USDA Forest Service 1994) eight have neither been reported in the Sitka Ranger District nor are suspected of occurring there. Of the remaining 14, three are reported as being known from the Sitka Ranger District. One of the 14 species, *Dodecatheon pulchellum alaskanum*, occurs frequently in several non-forested plant associations in the Ushk Bay Project Area. These associations include alpine lichen rock outcrop, alpine meadow, emergent mixed forb/grassland, lacustrine edge, muskeg, and riparian. All but one of the other species occur in habitats ranging from alpine and subalpine areas to wet meadows, beaches or beach meadows, freshwater shallows and streamsides, and rock outcrops, where no timber harvesting and very little other activity would occur. One species, *Hymenophyllum wrightii*, occurs in moist forest, such as many areas projected for timber harvest. Although none of the other species have been found in areas that would be affected by any of the Ushk Bay alternatives, extensive searches have not occurred.

Table 3-13.
Wetland Functions and Values by Wetland Type

	Wetland Type and Value				
Functions	*Estuarine*	*Muskeg*	*Alpine Meadow*	*Lacustrine*	*Riparian*
Water Quality Improvement	low-moderate	low-moderate	low-moderate	moderate	low-moderate
Floodflow Alteration	low	moderate	low	moderate-high	moderate-high
Biological Support	high	moderate	moderate	moderate	moderate-high
Groundwater Recharge/ Discharge	low-moderate	high	moderate-high	moderate	moderate-high

Source: Confer, 1992

3 Affected Environment

Wetlands serve several functions and are common in the project area.

Wildlife

Alaska's wildlife are valuable for aesthetic, economic, recreational, and subsistence reasons. Visitors come from all over the world to view bald eagles, mountain goats, brown bears, and other wildlife species in Southeast Alaska.

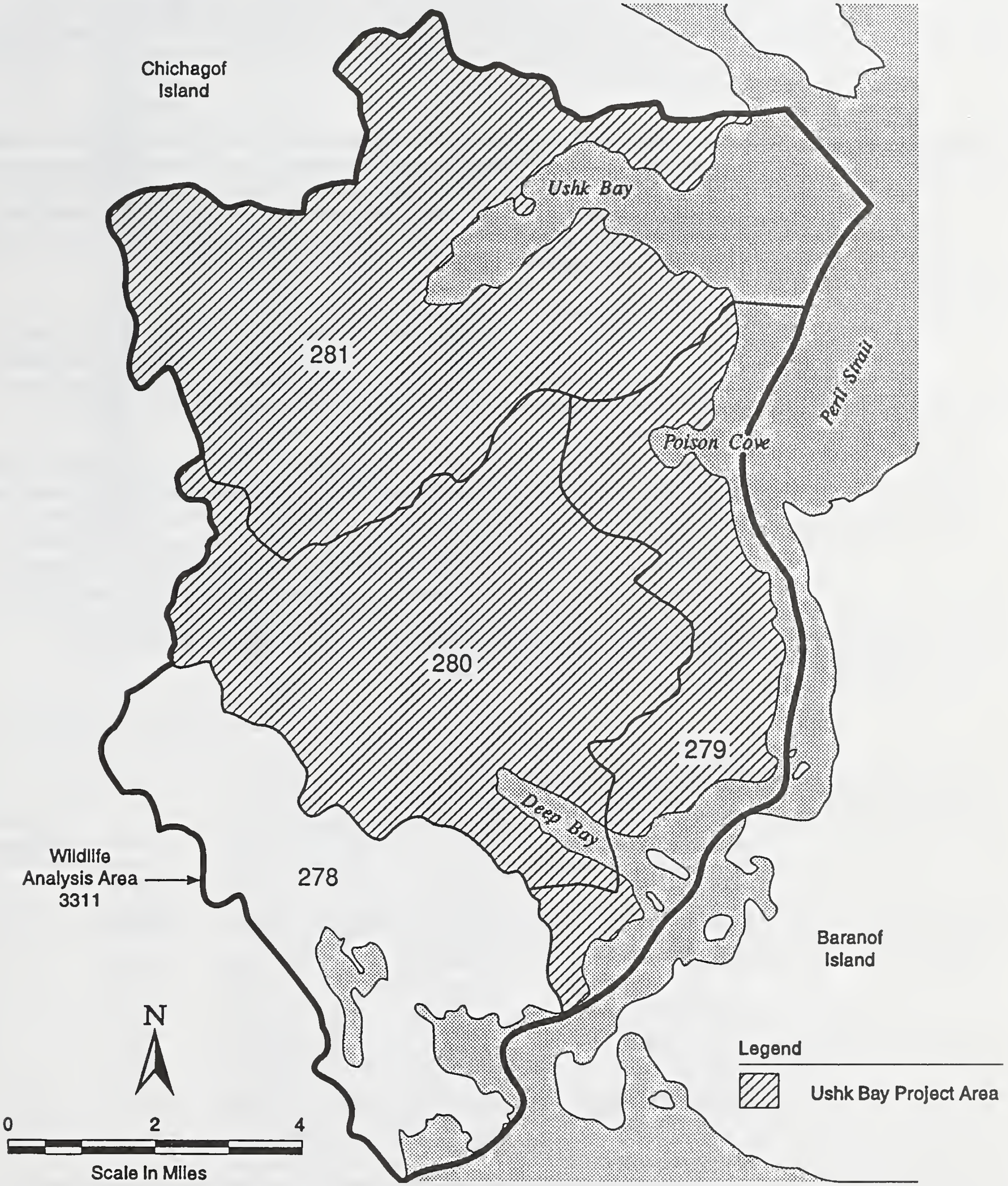
The Ushk Bay Project Area lies within one Wildlife Analysis Area (WAA) delineated by the State of Alaska to analyze harvest, population, and habitat data for wildlife planning and management. WAA 3311 includes all of the Ushk Bay Project Area and one VCU outside of the Project Area (Figure 3-2). WAA 3311 lies within Game Management Unit 4, which is a much larger area that includes all of Baranof, Chichagof, Kruzof, and Admiralty Islands. The larger Game Management Units are delineated by the State for regulatory purposes.

The Ushk Bay Project Area provides habitat for 200 wildlife species. These species occupy a diverse range of habitats in the Project Area. However, not all species inhabiting the Ushk Bay Project Area would be affected by the proposed actions or alternatives. Wildlife habitats were inventoried and species were selected if they were likely to be affected by proposed timber harvest activities in the Ushk Bay Project Area. Computer models were used to assess habitat conditions for several Management Indicator Species. Field reconnaissance was conducted to document wildlife use and existing habitat conditions in the Project Area.

Management Indicator Species

Management Indicator Species (MIS) are species whose population changes are used to indicate the effects of land management activities (Sidle and Suring 1986). MIS are a planning tool to promote more effective management of wildlife and fish habitats on National Forest Land. Through the MIS concept, the total number of species that occurs within a planning area is reduced to a manageable set of species that represents the complex of habitats, species, and associated management concerns. By providing habitat required by Management Indicator

Figure 3-2
Wildlife Analysis Area 3311



Species, all other species dependent on the same limiting habitat conditions are presumed to be protected.

Six MIS, the Sitka black-tailed deer, brown bear, marten, river otter, hairy woodpecker, and brown creeper were selected for detailed analysis based on habitat requirements, population densities according to the Habitat Capability Models, and potential impacts. Discussion of the bald eagle, an additional MIS, is also included because of special management agreements with the US Fish and Wildlife Service.

Wildlife Habitats

Habitat refers to the environment in which a species occurs. The environment can be described in physical terms, such as elevation, topography, slope and aspect; or in biological terms, such as vegetative cover or food availability. A species may occupy a range of different habitats or more than one distinctive kind of habitat in different seasons. Habitat types identified in the Project Area include old-growth forest, riparian, beach fringe, estuary fringe, and alpine. Each of these types is defined below.

Old-growth Forest

Old-growth forests are ecosystems distinguished by the presence of large 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 tree size, accumulations of large dead woody material, number of canopy layers, species composition, and ecosystem function.

Old-growth forest is inventoried in the GIS database as forest habitat over 150 years old with an average diameter at breast height greater than 9 inches, and with timber volumes greater than 8,000 board feet per acre. Based on this definition, a total of 16,100 acres of old-growth forest occur in the Ushk Bay Project Area (Table 3-14). This overlaps with acreage in the other defined habitat types, such as beach fringe, estuarine fringe, and riparian habitats. The results of timber stand examinations indicate that old-growth forests, as defined by GIS, meets the definition of old-growth developed by the Regional Interagency Old-Growth Task Force. This definition incorporates structural attributes, forest cover types and plant associations.

Table 3-14.

Acres of Wildlife Habitats by VCU

Habitat Type	Acres per VCU 279	280	281	Total	Percent of Total
Old-growth forest	4,285	4,098	7,717	16,100	36.0
Forest	7,251	12,155	15,044	34,450	77.0
Riparian	669	1,641	2,653	4,963	11.0
Beach fringe	933	287	842	2,062	5.0
Estuary fringe	767	448	1,004	2,219	5.0
Alpine	129	539	1,204	1,872	4.0
Ushk Bay Project Area	7,506	16,696	20,301	44,503	100.0

Source: Artman, 1992

Note: Because habitat types overlap, the total acreage of habitat types exceeds the total acreage of the Ushk Bay Project Area.

Forest
Forest habitat includes all areas with forest cover. Approximately 34,450 acres of forest habitat exist in the Ushk Bay Project Area (Table 3-14). Less than half of the forest habitat (47 percent) is old-growth forest. Approximately 321 acres of forest in the Project Area was previously harvested and is classified as regenerating forest. The remaining forest in the Project Area consists of low to moderate volume timber in high elevations on steep slopes, and in open habitats such as muskegs.

Riparian
Riparian habitat is 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 (USDA Forest Service 1991d). Riparian habitat is specifically defined for the Ushk Bay Project Area according to the presence of stream channels, riparian soils, and riparian vegetation associations (West et al. 1989). Approximately 4,963 acres of riparian habitat exist in the Project Area (Table 3-14). Riparian habitats are considered to be some of the most diverse and productive landscapes in Southeast Alaska (West et al. 1989). Many wildlife species use riparian habitat as a source of water, food, nest and roost sites, and corridors for movement. Riparian habitat is extremely important for bald eagles, furbearers, and brown bears.

Beach Fringe
Beach fringe is defined as the area within 500 feet of the marine water, consisting of the transition between land and water, and vegetated and nonvegetated conditions. Approximately 2,062 acres of beach fringe habitat occur in the Ushk Bay Project Area (Table 3-14). Brown bear, river otter, bald eagle, marten, and black-tailed deer are typical species that concentrate their activities during some or all seasons in forested stands within the beach fringe. Beach fringe habitat provides critical habitat for the Sitka black-tailed deer during periods of deep snow accumulation (Hanley 1984).

Estuary Fringe
Estuary fringe is defined as the area within 1,000 feet of the mean high water line along an estuary. Approximately 2,219 acres of estuary fringe occur in the Ushk Bay Project Area (Table 3-14). Bears, waterfowl, furbearers, and bald eagles are among the primary users of estuary fringe habitat.

Alpine
Alpine habitat is defined as area over 1,500 feet in elevation that is nonforested or has low-productivity forest because of the elevation. A total of 1,872 acres of alpine habitat exists in the Ushk Bay Project Area (Table 3-14). Alpine habitat is seasonally important for brown bear and Sitka black-tailed deer.

Habitat Capability

Habitat Capability Models were developed for each Management Indicator Species in Southeast Alaska by the USDA Forest Service, ADF&G, and USFWS. The models represent the compilation of scientific literature and the current knowledge of biologists pertaining to each of the Management Indicator Species.

The objective of the models is to estimate the quality of habitats as well as their ability to support populations of Management Indicator Species. Habitat quality is measured in terms of several factors that are assumed to be important for each species, including canopy cover, snowfall, elevation, and physiography. Based on these factors, each habitat is assigned a Habitat Suitability Index (HSI) ranging from 1.0 for optimal habitat to 0.0 for unsuitable habitat. The quality of each habitat is assumed to represent the relative carrying capacity of the habitat. Thus, HSI values are translated into potential population levels for each Management Indicator Species. An optimal habitat with an HSI value of 1.0 is assumed to support the maximum potential density of animals, while an unsuitable habitat with an HSI value of 0.0 is assumed to support no ani-

Habitat capability for Sitka black-tailed deer has decreased three percent because of previous timber harvest.

mals. Results do not predict actual populations, which frequently exceed or fall below habitat model predictions.

Sitka Black-tailed Deer

The Sitka black-tailed deer ranges through all major habitat types in the Ushk Bay Project Area. Low elevation old-growth forest provides critical winter range for both migratory and resident deer. During periods of heavy snow accumulation, deer concentrate in dense canopy, high volume old-growth forest dominated by western hemlock and Sitka spruce. The dense forest canopy sufficiently intercepts snow, and high-quality nutritious forage remains available in the understory.

Winter range is evaluated in the Habitat Capability Model because winter is the most limiting season for Sitka black-tailed deer (Suring et al. 1992a). Information used to predict habitat capability includes successional stage, timber volume class, elevation, aspect, and annual snow depth. The highest quality habitat areas identified by the model are high volume old-growth forests with dense canopies and well-developed understories, in low elevations and on southern exposures.

Results of the model indicate that the Ushk Bay Project Area is capable of supporting 1,385 deer during winter (Table 3-15). There has been a 3 percent decline in habitat capability for WAA 3311 from 1954 to 1991 because of previous timber harvest (USDA Forest Service Revision Database 1993). Moderate and high quality deer winter range comprises approximately 4,275 acres or 10 percent of the Project Area. The moderate and high quality habitat areas are located along the north shorelines of Ushk Bay, Poison Cove, and Deep Bay; and along portions of the Peril Strait coastline, and the main drainages.

Brown Bear

Brown bears use a variety of habitats, including alpine and subalpine meadows, coastal sedge meadows, riparian areas, and old-growth forest. Old-growth forest is used extensively throughout the year by brown bears for foraging, cover, and denning (Schoen et al. 1992). During late summer, bears concentrate along low-elevation coastal salmon streams where they fish along stream banks and forage on succulent vegetation and berries.

The Habitat Capability Model rates habitats on the basis of their value during the late summer because bears are most vulnerable to humans and management activities during this time when they concentrate along low-elevation streams (Schoen et al. 1992). Variables in the model used to predict habitat capability include forest successional stages, presence of beach fringe and es-

Table 3-15.

Wildlife Habitat Capability by VCU

	Number of Animals per VCU			
Species	*279*	*280*	*281*	**Total**
Sitka Black-tailed Deer	375	404	606	1,385
Brown Bear	12	20	26	58
Marten	16	19	28	63
River Otter	13	9	15	37
Hairy Woodpecker	69	66	141	276
Brown Creeper	17	27	45	89

Source: Artman, 1992.

Alpine habitat is important summer habitat for brown bear.

tuary fringe habitat, and presence of anadromous fish in streams. Reductions in brown bear habitat capability are represented in the model by the presence of roads, landfills, and other human development.

The model results indicate that the Ushk Bay Project Area is capable of supporting 58 brown bears (Table 3-15). There has been a 3 percent decline in habitat capability for WAA 3311 from 1954 to 1991 because of previous timber harvest, road construction, and other development in the area (USDA Forest Service Revision Database 1993). Moderate to high quality brown bear habitat comprises 3,889 acres or 9 percent of the Project Area. The high quality habitat areas are located along the major drainages (Ushk Creeks, Bear Creek, Poison Creeks, and Deep Creek) in the Project Area.

Marten

The marten occurs in mature conifer or mixed forest stands. Martens use large snags, downed logs, or undercut banks for den sites. They forage primarily on red-backed voles and red squirrels, which are generally abundant in undisturbed coniferous forests (Suring et al. 1992b). During winter, martens forage for prey almost exclusively under the snow. They use down woody material extending above the snow to gain access to prey under the snow (Suring et al. 1992b).

The Habitat Capability Model for the marten rates habitats on the basis of their value during the critical winter season. The critical habitat features for the marten during winter include canopy cover, small mammal availability and abundance, and resting and denning sites. Timber volume class is the primary variable in the model because it is assumed to indicate degree of canopy closure, availability of suitable snags, and presence of dead and down material in old-growth forests (Suring et al. 1992b). Habitats in the beach fringe and riparian zones are assumed to have higher value for the marten than upland habitats because of the presence of aquatic organisms as potential prey, undercut banks for dens and burrows, deciduous trees and grasses providing habitat for prey, and increased dead and down material from blowdown (Suring et al. 1992b).

Results of the model indicate that the Ushk Bay Project Area is capable of supporting 63 martens (Table 3-15). There has been a 3 percent decline in habitat capability for WAA 3311 from 1954 to 1991 because of previous timber harvest (USDA Forest Service Revision Database 1993). High quality habitat for the marten comprises 4,553 acres or 10 percent of the Project Area. The high quality habitat for martens generally overlaps with riparian and beach fringe habitats, and is located along the shorelines of Ushk Bay, Poison Cove, and Deep Bay, and along some of the main drainages.

River Otter

River otters are closely associated with aquatic environments. Habitat selection by river otters along the coastline in Southeast Alaska appears to be related to the availability of food resources and adequate cover (Suring et al. 1988). River otters use natural cavities formed by the roots of conifer trees and decaying snags near the beach as daytime resting sites. Throughout most of the year the majority of river otter activity occurs within 100 feet of the shoreline. Natal denning sites are located on well-drained sites near streams in old-growth habitats, up to 0.5 mile from the coastline. Stream courses are used as travel corridors between natal den sites and foraging areas on the shoreline.

The Habitat Capability Model for river otters rates habitats on the basis of their value during spring because river otters make use of all occupied habitats at this time (Suring et al. 1988). Old-growth forest within 500 feet of the shoreline is assumed to provide optimum habitat for river otters. Use of inland areas is assumed to be restricted to riparian habitats. Streams that produce anadromous and resident fish are assumed to provide suitable foraging habitat for river otters.

Results of the model indicate that the Ushk Bay Project Area is capable of supporting a total of 37 river otters (Table 3-15). There has been a 6 percent reduction in habitat capability for WAA 3311 since 1954 because of previous timber harvest (USDA Forest Service Revision Database 1993). High quality habitat for river otters comprises 4,005 acres or 9 percent of the Project Area. High quality habitat for river otters in the Project Area is located along the shorelines of Ushk Bay, Poison Cove, Deep Bay, Peril Strait, and along the main drainages.

Hairy Woodpecker

The hairy woodpecker is an uncommon permanent resident in Southeast Alaska. Hairy woodpeckers require large snags and partially dead trees for foraging and nesting. In Southeast Alaska, the hairy woodpecker inhabits mid- to high-volume old-growth stands of western hemlock and Sitka spruce (Hughes 1985).

The Habitat Capability Model for the hairy woodpecker rates suitability of winter roosting and foraging habitats (Suring et al. 1988). Habitat variables in the model include timber volume classes and forest successional stages which are assumed to be representative of the availability of snags. The highest quality habitat in the Project Area, assigned an HSI value of 1.0, consists of high-volume old-growth forest (greater than 30,000 board feet per acre). Results of the model indicate that the Ushk Bay Project Area is capable of supporting 300 hairy woodpeckers (Table 3-15). There has been a 7 percent decline in habitat capability for WAA 3311 since 1954 because of previous timber harvest. High quality habitat for the hairy woodpecker comprises approximately 392 acres of the Project Area.

Brown Creeper

The brown creeper is an uncommon permanent resident in Southeast Alaska. This species forages on the bark of large trees in high-volume old-growth stands of western hemlock and Sitka spruce (Hughes 1985). Large trees are preferred because a brown creeper can feed longer on a large tree and capture more prey per visit.

The Habitat Capability Model rates the suitability of winter habitat for the brown creeper (Suring et al. 1988). Timber volume class is the only habitat variable in the model. The highest

Bald eagle nests are generally located in large spruce trees near the shoreline.

quality habitat in the Project Area, assigned an HSI value of 1.0, consists of high-volume old-growth forest (greater than 30,000 board feet per acre). All other habitats are considered to provide minimal or no habitat value for brown creepers. Results of the model indicate that the Ushk Bay Project Area is capable of supporting 150 brown creepers (Table 3-15). There has been a 40 percent decline in habitat capability for WAA 3311 since 1954 because of previous timber harvest. High quality habitat for the brown creeper comprises approximately 392 acres of the Project Area.

Bald Eagle

The population of breeding bald eagles is dense and widely distributed throughout Southeast Alaska. The breeding population in Southeast Alaska is estimated at around 10,000 birds. This comprises approximately half of the estimated 20,000 breeding birds in the entire state of Alaska (Sidle et al. 1986).

Bald eagles in Southeast Alaska nest in old-growth coniferous forest habitats along the coastline and saltwater inlets. Nests are generally located within 300 feet of the shoreline in large Sitka spruce trees. Sitka spruce trees are preferred over western hemlock and western red cedar because they are taller and have a stronger top and branches (Sidle et al. 1986). Perching sites are an additional important component of bald eagle nesting habitat. Tall trees having a clear view of the nest and surrounding water provide the most valuable perching sites.

In the Ushk Bay Project Area, a total of 40 nest sites (both active and inactive) have been identified by the US Fish and Wildlife Service. The nests are distributed in the Project Area as follows:

- 24 nests in VCU 279,
- 4 nests in VCU 280,
- 13 nests in VCU 281.

Consumptive Use of Wildlife

Many of the wildlife species in the Tongass National Forest are important for subsistence and sport hunting. Harvest data for WAA 3311 for deer, brown bear, marten, and river otter are presented in Table 3-16. The deer harvest in WAA 3311 accounted for approximately 2 to 3 percent of the total deer harvest in Game Management Unit 4 between 1988 and 1992.

The Forest Service and ADF&G are developing population objectives for Sitka black-tailed deer, brown bear, black bear, marten, and mountain goat for Southeast Alaska. These population ob-

Table 3-16.
Number of Animals Harvested in WAA 3311

Year	Sitka black-tailed deer	Brown bear	Marten	River otter
1988	330	2	35	18
1989	306	2	8	10
1990	354	6	53	4
1991	56	1	64	12
1992	96	1	7	3
Total	1,142	10	167	47
Average per Year	228	2	33	9

Source: Artman 1992.

jectives are being developed to reflect hunter demand and use, and the need to maintain animal habitat and populations to meet that demand. In formulating the population objectives, ADF&G is considering three alternative population levels for each WAA: (1) current hunter demand; (2) a 25 percent decline in long-term habitat capability from the 1954 level; and (3) minimum viable population. To date, only population objectives for Sitka black-tailed deer have been finalized. The population objective for WAA 3311 is 1,443 deer (ADF&G 1992). This figure is based on the 1991 estimate of habitat capability for WAA 3311 (USDA Forest Service Revision Database 1993).

Populations needed to support harvest levels in WAA 3311 are based on the average harvest level between 1988 and 1992. The minimum population levels needed to support the average harvest level assume a 10 percent sustainable harvest of the deer population (Flynn and Suring 1989); a 4 percent harvest of the brown bear population (Schoen pers. comm.); a 40 percent harvest of the marten population (Flynn 1992); and a 20 percent harvest of the river otter population (Larsen 1983). A comparison of populations needed to support harvest levels with habitat capability and population objectives is presented in Table 3-17.

Habitat capabilities for brown bear and river otter appear high enough to support current harvest levels in WAA 3311. However, habitat capabilities for deer and marten are not high enough to support current hunter levels. This suggests that current harvest numbers are not sustainable over the long term. Although mild winters enabled deer populations to increase well above apparent habitat capability in the 1980s, a severe winter could reduce deer populations because existing deer winter range habitat cannot support the current population under heavy snowfall conditions. Fluctuation in deer populations is a natural phenomenon in Southeast Alaska, including the Ushk Bay Project Area.

Table 3-17.

Habitat Capability Compared to Numbers of Animals Harvested for WAA 3311

	Sitka black-tailed deer	Brown bear	Marten	River otter
Average Harvest per Year	228	2	33	9
Population Needed to Support Harvest[1]	2,280	40	84	47
ADF&G Population Objective[2]	1,443	—	—	—
Current Habitat Capability[3]	1,443	69	74	45

Source: Artman, 1992

1 Population needed to support harvest assumes a 10 percent sustainable harvest of the deer population (Flynn and Suring 1989); a 4 percent sustainable harvest of the brown bear population (Schoen pers. comm.); a 40 percent sustainable harvest of the marten population (Flynn 1992); and a 20 percent sustainable harvest of the river otter population (Larsen 1983).

2 ADF&G population objective based on the 1991 habitat capability estimate (USDA Forest Service TLMP Revision Database 1993).

3 From: USDA Forest Service TLMP Revision Database 1993.

Note: — indicates no data are available.

Threatened, Endangered, Candidate, and Sensitive Species

Table 3-18 summarizes the threatened, endangered, and candidate species which occur in or adjacent to the Ushk Bay Project Area. This list is based on consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service under Section 7 of the Endangered Species Act of 1973, as amended.

Table 3-18.

Threatened, Endangered, and Candidate Species Occuring in or Adjacent to the Ushk Bay Project Area

Common Name	Scientific Name	Federal Status[1]	State Status
Humpback Whale	*Megapteranovaengliae*	E	E
Steller Sea Lion	*Eumetopiasjubatus*	T	—
American Peregrine Falcon	*Falcoperegrinusanatum*	E	E
Arctic Peregrine Falcon	*Falcoperegrinus tundrius*	T	E
MarbledMurrelet	*Brachyramphusmarmoratus*	C2	—
Northern Goshawk	*Accipitergentilis*	C2	—
Harlequin Duck	*Histrionicushistrionicus*	C2	—

Source: Artman, 1992

1 E = Endangered

T = Threatened

C2= Category 2 Candidate

Threatened and Endangered Species

Humpback Whale

The humpback whale is the most abundant of the eight endangered species of whales that occur in Southeast Alaska. Humpback whales are regularly sighted in the Inside Passage and coastal waters from Yakutat Bay south to Queen Charlotte Sound (National Marine Fisheries Service 1991a). They feed in Southeast Alaska from about May through December, with peak numbers usually occurring during late August and September. An estimated 300 to 350 humpback whales inhabit Southeast Alaska during the summer and fall (Baker et al. 1985).

The local distribution of humpbacks in Southeast Alaska appears to be correlated with the density and seasonal availability of prey, particularly herring and krill (Bryant, et al. 1981; Baker, et al. 1985). Important feeding areas in Southeast Alaska include Glacier Bay, Icy Strait, Stephens Passage, Frederick Sound, Seymour Canal, and Sitka Sound (Baker, et al. 1985; Straley 1990). In the vicinity of the Ushk Bay Project Area, Deep Bay, Peril Strait, and Sitka Sound have been identified as important feeding areas for humpback whales (J.M. Straley, personal communication). Approximately 200 individuals have been observed feeding in this area during fall and early winter. This feeding area, like Seymour Canal, may be particularly important to whales arriving on the feeding grounds late or those in need of additional calories to survive the migration and demands of mating or calving on the breeding grounds (Straley 1990).

There is no designated critical habitat for humpback whales in or near the Project Area.

Steller Sea Lion

The Steller sea lion was designated as a threatened species in April 1990. Population levels in Southeast Alaska generally show a stable or increasing trend, compared with a declining trend in other parts of the species' range (National Marine Fisheries Service 1991b). A Steller sea lion rookery is located on the west side of Chichagof Island, approximately 18 miles west of the Ushk Bay Project Area. Steller sea lions may feed in the vicinity of the Project Area. They eat a variety of fish and invertebrates. Potential prey items in marine waters of the Project Area include Pacific cod, Pacific herring, and salmon (S. Pennoyer, personal communication). There is no designated critical habitat for Steller sea lions in or near the Project Area.

American and Arctic Peregrine Falcons

The American peregrine falcon is primarily associated with interior Alaska for breeding, nesting and rearing of young. The Arctic peregrine falcon is primarily associated with the area north of the Brooks Range and Seward Peninsula. Both species occur in Southeast Alaska only during migration. Actual migration routes and foraging areas have not been identified. One of the primary habitat factors affecting the presence of peregrine falcons during migration is the availability and abundance of prey. Prey in Southeast Alaska includes shorebirds, waterfowl, and songbirds. Peregrine falcons forage in the vicinity of seabird colonies and waterfowl concentration areas, but also forage over open sites such as marshes, grasslands, and shorelines. No peregrine falcons were observed in the Project Area during field reconnaissance.

Candidate Species

Marbled Murrelet

The marbled murrelet is currently listed as a threatened species in California, Oregon, and Washington, and is a Category 2 Candidate in Alaska. Marbled murrelets are abundant in Southeast Alaska. Estimates of the population size in Southeast Alaska range from 75,000 to 150,000 birds (Mendenhall 1992).

Marbled murrelets forage year round in nearshore marine waters, congregating in well-defined areas where food is abundant. Food consists mainly of small fish, such as Pacific sand lance and invertebrates (Sealy 1975). Marbled murrelets are common in marine waters of the Ushk Bay Project Area. A total of 556 marbled murrelets were counted along the shoreline of the Project Area during a marine survey conducted in July 1992. Large concentrations of murrelets were observed in Ushk Bay, off Point Marie, in Poison Cove, and near Little Island.

Marbled murrelets spend the majority of their lives in the marine environment but nest in inland old-growth forests. Nesting habitat is characterized by the presence of large trees, multiple canopy levels, and moderate to high canopy cover. Two tree nests have been located in Southeast Alaska: one on Baranof Island near Kelp Bay, in an open stand of mountain hemlock old-growth forest, approximately 0.5 mile from salt water (Quinlan and Hughes 1990); and one on Prince of Wales Island near Polk Inlet, in a high volume old-growth stand of western hemlock and Sitka spruce, approximately 0.25 mile from salt water (C. Flatten personal communication).

Stand size is an additional important habitat component for marbled murrelets because the species nest in loose colonies or aggregations (S.K. Nelson, personal communication). In California, Oregon, and Washington, marbled murrelets were detected more often in stands larger than 500 acres and fewer were detected in areas fragmented by clearcutting (USFWS 1992).

Marbled murrelets are likely to nest in old-growth forest habitat in the Ushk Bay Project Area, although no evidence of nesting activity was observed during field reconnaissance. Since all inland forest stands in the Project Area are less than 8 miles from salt water, all forested stands could be potential marbled murrelet nesting habitat. Without precise knowledge to delineate suitable habitat in the Project Area, all old-growth forest with greater than 8,000 board feet per acre is assumed to be suitable for nesting.

Northern Goshawk

The northern goshawk is a Category 2 Candidate throughout its range in the United States, and is also listed as a Sensitive species in the Alaska Region of the Forest Service. The northern goshawk is dependent on large tracts of mature and old-growth forest for nesting and foraging habitat. Goshawks usually forage in old-growth forests because prey are more abundant there than in younger forests. Also, the higher canopy and widely spaced trunks of large trees facilitate flying and hunting. Goshawks are adapted for hunting in dense, old-growth forests: their short rounded wings and long tails are excellent for maneuverability, and their strong eye guards provide some protection while flying through brush (Crocker-Bedford 1990b).

Reported home ranges of northern goshawks range from 5,000 to 7,500 acres (Reynolds 1983). Research on home range size, habitat requirements, and nesting activities is currently being conducted in Southeast Alaska. Home ranges of northern goshawks in Southeast Alaska consist primarily of old-growth forest but also include open areas where they forage opportunistically on seabirds, waterfowl, and northwestern crows (Crocker-Bedford 1990b).

No northern goshawks were observed during the wildlife reconnaissance, and no goshawks were detected when a tape of conspecific calls was broadcast across an estimated 865 acres of old-growth forest. Goshawks are known to occur in the Ushk Bay Project Area, according to the following observations:

- one individual northern goshawk was observed by a silviculture crew on June 27, 1992 in a forested stand along Deep Creek, approximately one-half mile from Deep Bay;
- two adult goshawks were accidentally captured in furbearer traps near Ushk Bay, probably within the beach fringe habitat, in December 1991 (D. Hardy and P. Mooney, personal communication);
- and one adult goshawk, rehabilitated at the Raptor Center in Sitka during the summer of 1991, was also captured near the Project Area (D. Hardy and P. Mooney, personal communication).

Harlequin Duck

The harlequin duck is a candidate for federal listing as a threatened or endangered species. The harlequin duck is a fairly common year-round resident in Southeast Alaska (Armstrong 1990). Harlequin ducks breed exclusively on whitewater streams. They generally nest along second order or greater streams with a cobble to boulder substrate, a relatively healthy stream macroinvertebrate population and some shallow and low-gradient reaches (Cassirer and Groves 1991). Nests are well hidden and often difficult to locate. Portions of the Ushk Bay Project Area may provide suitable nesting habitat for harlequins, but no harlequins were observed during stream surveys conducted by the fisheries biologists. One adult male harlequin duck was observed during the marine wildlife survey on July 15, 1992, near Sergius Narrows at the south end of the Project Area. Most males are known to return to the coast shortly after females begin incubation (Cassirer and Groves 1991).

During winter, harlequin ducks are common to abundant in coastal waters of Southeast Alaska (Armstrong 1990). They winter close to reefs, rocky islands and cobble beaches, usually in small groups and occasionally in rafts of several hundred or more. Wintering harlequins feed mainly on snails, crabs, amphipods, isopods, mollusks and other invertebrates associated with rocky and gravel substrates and kelp and eelgrass beds (Cassirer and Groves 1991).

Sensitive Species

Three species, in addition to the northern goshawk discussed above, are designated by the Forest Service as Sensitive in Southeast Alaska: the osprey, trumpeter swan, and Peale's peregrine falcon. None of these three species are known to occur in the Ushk Bay Project Area.

Biological Diversity

Biological diversity encompasses the variety of life in an area, including the variety of genetic stocks, species, plants and animal communities, ecosystems, and processes through which individual organisms interact with one another and their environments (USDA Forest Service 1991d). Regulations of the National Forest Management Act mandate protecting biological diversity of national forest lands, as well as maintaining population viability and preserving long-term productivity. Biological diversity of plants in the Ushk Bay Project Area is described in terms of the following characteristics:

- species and habitat diversity;
- presence of old-growth habitat conditions;
- fragmentation of old-growth habitat; and
- population viability.

Species and Habitat Diversity

Plant Species Diversity

Approximately 80 percent of the approximately 1,000 plant species occurring in Southeast Alaska are expected to occur or potentially occur in the Ushk Bay Project Area. During field studies, 145 species of plants were observed in the Project Area occurring in forested, non-forested, and wetland communities. Table 3-19 summarizes the number of plant species occurring in Southeast Alaska and the Project Area (observed and expected) by life form.

Plant Community Diversity

The forests of Southeast Alaska have been classified into one ecological type, seven series, and 57 plant associations (Martin 1989). Of these forested communities, four series and eight plant associations are major communities within the Project Area. Though not classified into associations, 18 non-forested plant communities also occur within the Tongass National Forest. Eight of these non-forested communities occur within the Project Area. The remaining Southeast Alaska plant series and associations may occur in the Project Area to a limited extent.

Wildlife and Habitat Diversity

The Ushk Bay Project Area provides potential habitat for 181 species: 22 mammals, 155 birds, and 4 amphibians. These animals inhabit a wide range of habitat types in the Project Area, from old-growth forest to open muskegs, and from high elevation alpine meadows to marine inlets and bays. Table 3-14 displays the types and abundance of habitat types that exist in the Project Area.

Old-growth Habitat

Old-growth forest comprises 16,100 acres (approximately 36 percent) of the total 44,503 acres of the Ushk Bay Project Area (Table 3-14). This acreage of old-growth forest was defined in the Geographic Information System as forest habitat over 150 years old with an average diameter at breast height greater than 9 inches and with timber volumes greater than 8,000 board feet per acre.

Table 3-19.

Number of Plant Species, Subspecies, and Varieties by Life Form Occuring in Southeastern Alaska and the Ushk Bay Project Area

Life Form	SE Alaska	Ushk Bay *Expected*	Ushk Bay *Observed*
Tree	23	18	8
Shrub	95	77	20
Forb	626	514	88
Graminoid	217	182	19
Pteridophyte	52	43	10
TOTAL	1,013	834	145

Source: Confer, 1992

Old-growth forest comprises 36 percent of the project area.

Old-growth forest is more specifically defined by the presence of structural characteristics, such as snags, down logs, and understory vegetation. Old growth definitions were developed by a Regional Interagency Old Growth Task Force to incorporate structural attributes, forest cover types, and plant associations. These characteristics are summarized in the TLMP SDEIS (USDA Forest Service 1991d). Results of the timber stand examinations indicate that all of the old-growth forest as defined by GIS analysis meets the definition of old growth according to the structural characteristics listed in the TLMP SDEIS (USDA Forest Service 1991d).

Fragmentation of Old-growth Habitat

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 this patch size and distribution. Fragmentation of the Ushk Bay Project Area is expressed in terms of minimum habitat area required by the Sitka black-tailed deer because this species is considered to be sensitive to habitat fragmentation (Suring et al. 1992a).

Fragmentation of large blocks of old-growth into small patches through clearcutting results in two types of impacts to preferred winter habitat for Sitka black-tailed deer: (1) scattered patches of critical winter range potentially serve to concentrate deer, with resulting overuse of forage and reduced carrying capacity; and (2) windthrow is common along the edges of clearcuts and may decrease the area of protected deer habitat (Hanley 1984). Contiguous patches of old-growth forest greater than 1,000 acres are assumed to provide optimum wintering habitat conditions for Sitka black-tailed deer (Suring et al. 1992a).

Large blocks of old-growth habitat (greater than 1,000 acres) are located along North Ushk Creek, South Ushk Creek, Bear Creek, and Deep Creek. Smaller contiguous blocks are located throughout the Project Area. The size of many blocks of old growth in the Project Area is constrained by topographic relief as well as the natural interspersion of muskegs, alpine areas, and forest habitat with lower timber volumes. Previous timber harvest in the Project Area has resulted in some fragmentation of old-growth forest. A total of 321 acres was clearcut between 1956 and 1966 along the southern shoreline of Ushk Bay and near the mouth of West Ushk

Creek. Thus, the availability of large blocks of critical deer winter range in the Ushk Bay Project Area is limited by natural fragmentation of the landscape as well as by previous timber harvesting.

The analysis of forest fragmentation in the Ushk Bay Project Area was based on the total number of old-growth forest patches within specific patch size classes. Patch size classes were selected to represent Management Indicator Species requirements (Suring 1993). Old-growth forest patches were defined as the amount of contiguous old growth of volume class 4 and above. Interior old-growth forest conditions were delineated by identifying contiguous patches of old-growth forest greater than 1,200 feet wide. Table 3-20 displays the acreage in each patch size class for existing conditions.

Population Viability

The National Forest Management Act provides direction to maintain viable populations of animals that are well distributed throughout the Project Area. All species currently existing in the Ushk Bay Project Area are assumed to be viable based on analyses done for the TLMP SDEIS (USDA Forest Service 1991d). The baseline of species viability for the Project Area is represented by results of the Habitat Capability Models for the management indicator species.

Fish and Water Resources

The Project Area is within the maritime climate of Southeast Alaska, with heavy precipitation and relatively cool summers and mild winters. The average annual precipitation varies spatially and with elevation in the region due to orographic effects of mountains. Similarly, streamflow varies in response to precipitation. Water quality of streams is influenced by the high precipitation and relatively pristine environment, with relatively low levels of dissolved minerals.

Hydrology and Channel Morphology

Fish habitat is a function of channel and flow conditions. Therefore, the type, quality, and availability of habitat is highly variable within watersheds (Sullivan et al. 1987). High rainfall (approximately 110 inches/year), dense riparian vegetation, and watersheds with diverse topography provide many diverse habitats for salmon and resident fish spawning and rearing. Maintenance of this habitat and associated high water quality is essential for maintaining spe-

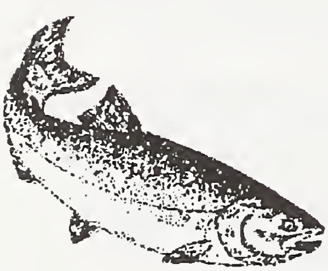


Table 3-20.
Acreage of Old-growth Forest Patches in the Ushk Bay Project Area

Patch Size (Acres)	Acres	Percent of Old-growth Forest in the Project Area
0 to 25	1,284	8
26 to 100	2,896	17
101 to 500	4,822	29
501 to 1,000	4,123	25
1,001 +	3,496	21
Total	16,621	100

cies abundance and diversity. State of Alaska water quality criteria for maintaining the natural productivity of aquatic systems, streams, lakes and estuaries include fine sediment and turbidity, dissolved oxygen, temperature, pH, and stream chemistry. Chemical characteristics of the water throughout the Chichagof Island area are very similar but ultimately dependent upon the soil and parent materials. Water quality in this area is considered to be very good. Regional water quality, based on USGS period of record, indicate that stream pH ranges from 6.4 to 8.3, temperatures range from 0 to 13.5 □C, and turbidity ranges from 0.3 to 6 nephlalometric turbidity units (USGS 1992). Detailed information on water quality, hydrology, and channel morphology (generally described as channel shape) of the area is included in the Planning Record (Bjerklie and Stroud 1992).

Large woody debris (LWD) is recognized as playing an important role in controlling channel morphology, the storage and routing of sediment and organic matter, and the creation of fish habitat. Gradual entry of LWD into the aquatic system is desirable to maintain stream habitat diversity and stability. Large amounts entering abruptly can be detrimental to the aquatic ecosystem by becoming a physical barrier and causing bank erosion and channel migration problems.

Fish and Aquatic Habitat

Anadromous fish species within the Project Area include pink (humpback), chum (dog) and coho (silver) salmon, and Dolly Varden (Dolly Varden char). There are undocumented reports that small populations of sockeye (red) salmon, and chinook (king) salmon inhabit bays and estuaries of the area. Resident game species include cutthroat and rainbow trout and resident Dolly Varden. Resident non-game species include sculpins. These aquatic resources are important to sport, commercial, and subsistence users of the area.

The fish species found in the Project Area vary considerably in their life histories. Therefore, a variety of factors and habitats can affect their production in fresh water. Anadromous species have developed complex life cycles that utilize freshwater habitats for reproduction. Eggs are deposited and incubated in the streambed, and rearing of juvenile coho, chinook, and sockeye salmon and anadromous Dolly Varden can take place in freshwater from a few months to several years. Pink and chum salmon fry migrate seaward within a few days of emerging from the gravel. Resident species generally have more simple life histories that are fulfilled entirely in fresh water with some species making short migrations within the freshwater environment for breeding or rearing.

Streams of the Project Area are classified by Aquatic Habitat Management Units (AHMUs) which are geographically definable areas with distinctive resource values and characteristics. They are comprised of the aquatic and riparian ecosystems. There are three AHMU classes used to summarize aquatic resources. They are generally defined as follows:

Class I: Streams with anadromous fish (that ascend rivers from salt water to spawn) or adfluvial fish (that live in lakes but enter streams to spawn). This includes good quality sport fisheries systems. Also included is the habitat upstream from migration barriers known to have reasonable enhancement opportunities for anadromous fish.

Class II: Streams with resident fish populations. These populations have limited sport fisheries values, and generally occur upstream of migration barriers and 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.

There are over 200 miles of classified streams in the Project Area (Table 3-21). Of these streams, approximately 44 miles are class I, 50 miles are class II, and 110 miles are class III streams. These streams are presented by the three Value Comparison Units (VCUs) in the Project Area. VCU 281, generally located in the Ushk Bay drainage, contains the most miles of all three

A fall run of chum salmon cccurs in Deep Creek.

stream classes. VCU 280 has the second greatest number of miles in all three stream classes and its location is generally described as the Deep Bay drainage. VCU 279 is generally located along Peril Strait from Poison Cove to Deep Bay and has considerably less stream miles than either VCUs 280 or 281.

VCU 279 encompasses streams that drain into Peril Strait and Poison Cove from Point Marie to the southern edge of the Project Area south of Deep Bay. There are six ADF&G numbered streams in this VCU. This VCU has approximately 6.1 miles of anadromous fish habitat, 7.2 miles of resident fish habitat and 15.8 miles of mapped Class III habitat. VCU 280 encompasses most of Deep Bay and its streams and tributaries. This VCU contains approximately 15 miles of anadromous fish habitat, 20.3 miles of resident fish habitat, and 40.7 miles of mapped Class III habitat. VCU 281 has seven ADF&G numbered anadromous streams (ADF&G 1987a). Six of these streams drain directly into Ushk Bay and one stream drains into Peril Strait near the mouth of Ushk Bay. A total of about 22.5 miles of stream is available to anadromous fish. The Ushk Bay system contains about 22.1 miles of resident fish habitat and 53.6 miles of mapped Class III habitat. The estuarine areas of Ushk Bay, Poison Cove and Deep Bay provide feeding, rearing and breeding habitat for anadromous and marine fish.

Fish Productivity

A number of streams in the Project Area produce salmon, but data on the numbers are available only for the larger streams. Deep Bay Creek produces the largest runs of pink salmon in the Project Area, with peak escapement counts of more than 100,000 fish in recent years. The available information on salmon productivity of the streams in the Project Area is given in Table 3-22.

Management Indicator Species (MIS)

The pink salmon is the most abundant anadromous species of the Project Area, and Dolly Varden is the most abundant resident species. Pink salmon rear in the estuarine areas. Coho salmon were found to be the most abundant anadromous species rearing in streams in the area. These three species represent the greatest subsistence, commercial and sport fishery potential in the area and also present a representative cross-section of life cycles represented in the Project Area. For the above reasons, these species are selected as Management Indicator Species (MIS). The selection of MIS species assists in focusing the analysis of aquatic resources.

Demand for Fisheries

The aquatic resources of the Project Area are very important to Sitkans and other surrounding communities for subsistence, commercial and sport purposes. Subsistence fishing represents a major focus of life for many Southeast Alaska residents. Harvest of all salmon species constitutes 21 percent of the total harvest of subsistence resources in Southeast Alaska. Deep Bay produces the largest runs of pink salmon in the area. These pink salmon are important to

Table 3-21.

Ushk Bay Project Area Streams - Total Length of Class I, Class II, and Class III Streams per VCU in Miles

	VCU 279	VCU 280	VCU 281	Total
Class I	6.1	15.0	22.5	43.6
Class II	7.2	20.3	22.1	49.6
Class III	15.8	40.7	53.6	110.1
TOTAL	29.1	76.0	98.2	203.3

Source: Reub and White, 1992

the overall success of commercial fish harvest from Salisbury Sound to Deep Bay. Sport fishing is also an important part of the Southeast Alaska lifestyle. Salmon and trout provide one of the most important recreational activities for residents of the region, and fishing opportunities attract thousands of visitors annually.

Threatened, Endangered, and Sensitive Fish Species

No fish species known to occur in the Ushk Bay Project Area has been determined to be threatened, endangered, or sensitive.

Streamflow

Stream characteristics and channel morphology in the Project Area reflect natural processes in the region, and show no apparent impact from past human activities. High bedload in stream channels resulting from landslides and mass-wasting events has affected many stream channels in the Project Area, impacting fish habitat conditions.

The mainstem reaches of most of the streams in the area provide good habitat for fish rearing and spawning (see the Fish Resource section). However, many of the mainstem channels and tributary channels are building up with sediment due to the high bedload contribution delivered via V-notch channels. In some areas, landslides have directly impacted stream channels causing flow to divert around them. Because of the preponderance of high bedload, some channel reaches in mid- to low-relief portions of mainstem streams are dry during low-flow periods, with baseflow infiltrating into alluvial gravels and flowing underground.

Estuarine areas provide feeding, rearing, and breeding habitat for anadromous and marine fish.

Muskegs and riparian zones store water and act as sediment traps along many streams in the Project Area. Water stored in these areas is released over time and maintains baseflow in streams. In watersheds with wider floodplains and riparian corridors, bedload and sediment delivered from high-gradient V-notch channels is often trapped before entering the mainstem channels of streams, minimizing the impact of mass wasting and landslides on stream habitat.

Table 3-22.
Mean Peak Escapement Survey Counts by Major Stream and VCU[1]

VCU	Geographic Area	ADF&G Stream No.	Mean Peak Escapement Counts for Recent Years: Pink Salmon	Chum Salmon	Coho Salmon	Total
279	Poison Cove North	113-55-10120[2]	—	—	—	—
	Poison Cove South	113-55-10110	4,000[3]	975[3]	—	4,975
	Peril Strait	113-63-10060[4]	—	—	—	—
					VCU Total	4,975
280	Deep Bay	113-64-10010	100,000[3]	1,500	183[3]	101,683
					VCU Total	101,683
281	Ushk Bay South	113-56-10020	8,500[3]	1,100[3]	—	9,600
	Ushk Bay West	113-56-10030	14,000[5]	1,600[6]	—	15,600
	Ushk Bay North	113-56-10050	2,000[3]	300[3]	—	2,300
					VCU Total	27,500
Total (All VCU's)			128,500	5,475	183	134,158

Source: Reub and White, 1992

[1] Escapement is generally described as the number of fish returing to a particular stream to spawn during a year. Peak escapement survey counts are the largest number of fish counted at a particular stream on a certain day, which is less than total escapement as fish return over a period of days.

[2] Estimated escapement capacity for pink, chum and coho salmon combined for this stream is 10,000 (USFS, unpublished data). Estimated escapement capacity is generally described as estimated number of adults that the habitat could support.

[3] Peak escapement counts averaged in recent years (ADF & G, 1992).

[4] Estimated escapement capacity for pink, chum and coho salmon combined for this stream is 5,000 (USFS, unpublished data). Estimated escapement capacity is generally described as estimated number of adults that the habitat could support.

[5] Peak escapement counts averaged since 1982 (ADF&G, unpublished data).

[6] Peak escapement counts averaged since 1961 (ADF&G, unpublished data).

Water Quality

Water quality in the Project Area is good, with low dissolved solids, suspended solids and turbidity, and also conforming to ADEC criteria for fish propagation and growth. There is no comprehensive water quality data base for streams in the Project Area, however one time sampling of streams (Table 3-23) in the Project Area and vicinity indicate that area water quality is similar to regional conditions.

Regional water quality data obtained from the US Geological Survey indicates a range for pH of 6.4 to 8.3, depending on streamflow, and temperature ranging from 0 to 13.5□C depending on the season and time of day. Dissolved solids ranged from 19 to 58 mg/l, alkalinity ranged from 7 to 44 mg/l, suspended solids ranged from 0 to 178 mg/l, and turbidity ranged from 0.3 to 6.0 NTU. Other than temperature, these parameters all vary according to streamflow, with turbidity and suspended sediments higher with increasing streamflow, and alkalinity, pH, and dissolved solids lower with increasing streamflow.

In general, the water quality data base does not include peak flow events or extreme low flow events. Thus, water quality parameters during these flow periods are not represented. Due to the lack of fine sediments observed in stream channels, high suspended sediment loads and turbidity would not be expected even during peak flow events. However, slugs of high sediment concentrations may move through stream systems after landslides occur in the watershed. During extreme low flow periods, water temperatures may rise above the documented range with a

An example of the high bedload in stream channels of the Ushk Bay area due to natural landslides.

subsequent reduction in dissolved oxygen level due to low solubility, increased groundwater contribution to baseflow, and a reduction in turbulent flow which introduces oxygen into the stream.

Marine Resources

The intertidal and shallow subtidal communities of the Ushk Bay region contain a very diverse and abundant array of marine fishes, invertebrates, and benthic macro algae. Indeed the marine waters of the Pacific Northwest, Southeast Alaska, and the Gulf of Alaska are extremely productive, providing significant opportunities for commercial, subsistence, and recreational use of these resources.

Table 3-23.
Project Area Water Quality[1]

Watershed Number[2]	pH (Standard Units)	Temperature (°C)	Specific Conductivity (µmhos/cm)
011A	7.7	9.2	81.4
015A	7.8	13.7	58.7
016A	8.0	9.2	48.7
018A (Stream)	7.4	7.8	51.3
018A (Spring)	8.0	7.2	48.6
045A	7.3	10.2	63.0
N81A	8.0	9.4	50.0
N82A	7.9	16.2	39.7

Source: Bjerklie and Stroud, 1992
1 One-time sampling, July 9, 1992
2 Sampled at mouth of mainstem on July 9, 1992.

The interface between marine and terrestrial environments can be quite varied. From a marine perspective, the substrate within intertidal or subtidal habitats are generally described as being stable (i.e., bedrock or very large boulders) or unstable (cobble, gravel, sand, or mud) or hard or soft. These designations are quite subjective though individual authors may provide specific guidelines or criteria that define their usage of a particular categorization. A short summary of size limits for various particle sizes is given below in Table 3-24.

In general, marine organisms are habitat specific. Animals and plants associated with quiet bays and estuaries are quite different from those found on exposed beaches. In addition to the differences in substrate type, organisms from varied locations may show a wide array of physiological tolerance limits. These limits, as well as exposure to predators, can influence the distribution of organisms. This is especially true within the intertidal.

The six sites proposed as LTFs (see Figure 3-3) vary in the composition of their intertidal and subtidal substrate and their exposure to wave action and currents. Some are similar while others are very different.

South Ushk Bay LTF Site

Ushk Bay is a large marine embayment to the west of the mouth of Hoonah Sound on Peril Strait. The bay bends to the south with the total length of the bay including the estuarine tide flats at the head of the bay being approximately 4.4 miles long. There is a large island-like headland on the north shore of the bay to the west of the bend. The eastern portion of Ushk Bay is exposed to a large expanse of open water, while the western leg is effectively protected by the shape of the bay and the headland describe above. The NOAA National Ocean Service navigation chart 17323 for Salisbury Sound, Peril Strait, and Hoonah Sound depicts a log storage area at the head of Ushk Bay. This site was actively used as a log storage facility from 1969 through 1985 when permits expired (Mr. Ken Hammons, APC, pers. comm.). APC presently holds an active permit from the U.S. Army Corps of Engineers for continued use of this site, and the State of Alaska has granted a 5-year tideland permit for use of the site until a lease is issued.

One proposed LTF in Ushk Bay is located on the south shore of the bay, to the west of the bend of the bay, approximately 1.5 miles from the salmon stream at the head of the bay (see Figure 3-3). The intertidal zone at the South Ushk Bay LTF is quite steep and composed of medium-sized boulders giving the appearance of riprap. The slope of the beach continues into

Table 3-24.
Partial List of Wentworth Scale of Grain Sizes

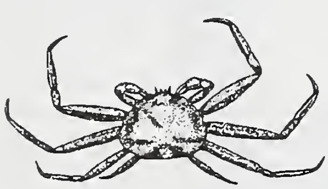
Particle	Minimum Size (mm)
Boulder	256
Cobble	64
Pebble	4
Granule	2
Very Coarse Sand	1
Coarse Sand	0.5
Medium Sand	0.25
Fine Sand	0.125
Very Fine Sand	0.0625

Source: Levinton, 1982

the subtidal zone, but the substrate changes from boulders to predominantly calcareous debris (mollusk shells). The plates and shell pieces of dead barnacles and the valves of various species of clams form a layer approximately 4 inches deep at about 9 feet below MLLW. A total of five scuba dives were made on the subtidal at the Ushk Bay site, and while these dives were made during periods of maximum tidal exchange, no significant current was experienced by the divers. The community organization at this site is quite rich and is composed generally of numerous species of infaunal filter-feeding bivalves and their predators. The bottom was covered with a fine layer of sediments that could be easily resuspended by the movements of motile invertebrates and the divers. While vigorous currents were not observed in that area, the structure of the benthic community, i.e. the presence of filter-feeding anemones and sea pens, would indicate regular flushing and continual water movement over the site.

Ushk Bay has a high incidence of use for recreational, subsistence, and commercial fishing for shellfish and marine and anadromous fishes (Montgomery & Berg 1977; Art Schmidt & Cathy Botelho, ADF&G, pers. comm.). Commercial catches of Dungeness crab at the head of the bay are not specifically recorded (Cathy Botelho, ADF&G, pers. comm.), but divers have observed large numbers of Dungeness and red king crab mating in shallow waters along the north shore of Ushk Bay just west of the knee of the dog leg of the bay (Hughes et al. 1986; Hughes 1985; US Fish & Wildlife Service 1983). No specific records are kept of sport catches of red king crab or Dungeness Crab from Ushk or Deep Bays, but both sites are heavily utilized for sport shellfishing (Art Schmidt, ADF&G, pers. comm.). While no red king crab were observed at the proposed LTF site, a pod of juvenile red king crab estimated to be in excess of 100 animals was noted within the shallow subtidal on the north side of the bay during a low spring tide of < -3 feet. Additionally, Ushk Bay is commonly used as an anchorage for commercial and pleasure boats during periods of inclement weather. Ushk Bay is a very popular area among the residents of Sitka. Ushk Bay is a unique marine habitat with high value as both a source for commercial and subsistence use of marine resources and habitat for those resources.

North Ushk Bay LTF Site

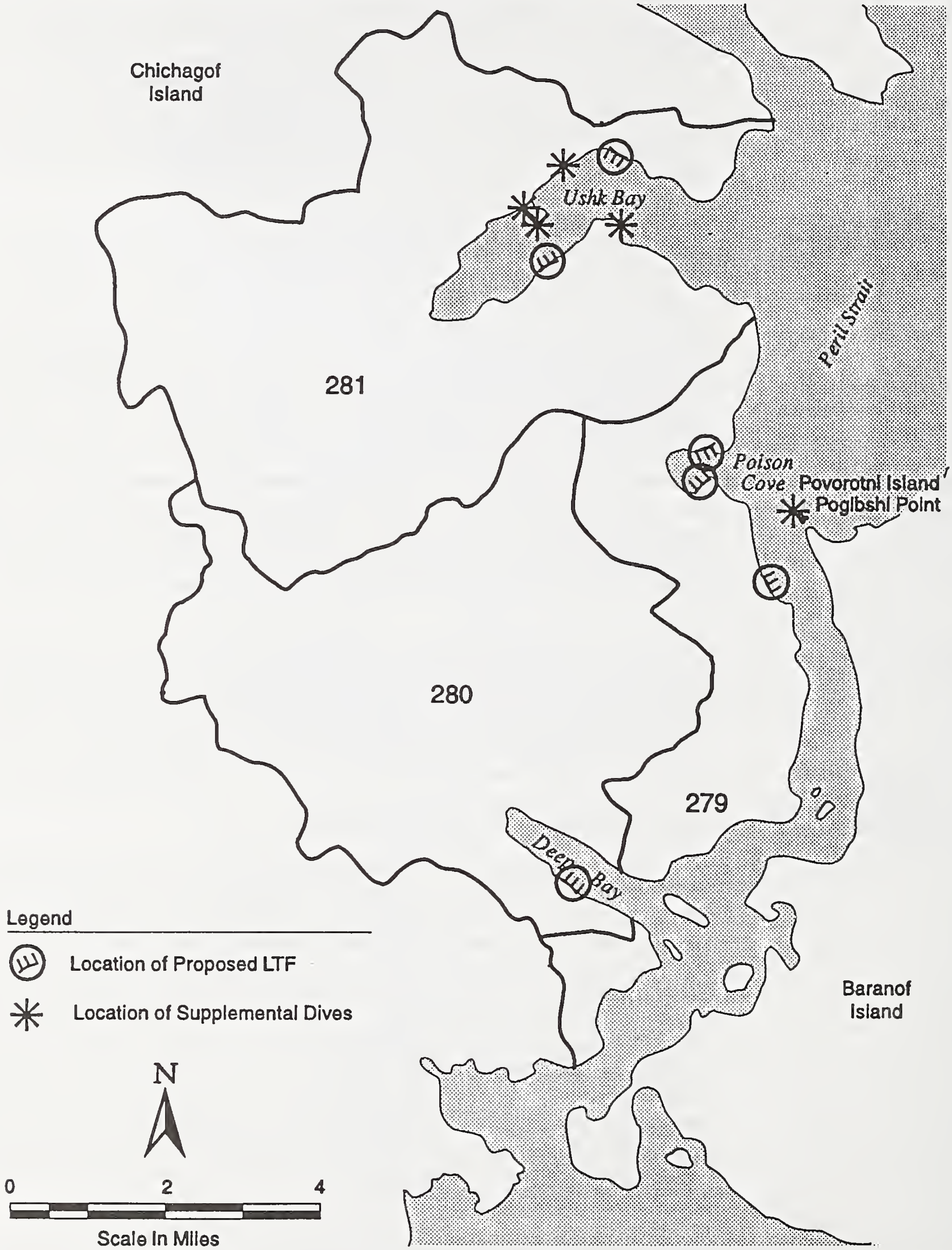


Another proposed LTF site is on the north shore of Ushk Bay, just east of the bend of the bay. This site is a cobble and gravel delta with relatively little slope to approximately 5 - 6 feet below MLLW where there is a very sudden and steep drop off. Based on observations during dives in this area (at the site [Boes, 1993] and approximately 750 feet west of site [J.L. Cameron, personal observation]), there are many similarities between the benthic fauna and flora of this site and sites with similar substratum within the general area. Notable exceptions include concentrations of organisms occurring between 20 and 50 feet below MLLW and few benthic organisms being observed below a depth of 50 feet.

The California sea cucumber *Parastichopus californicus* was unusually abundant between 20 and 40 feet below MLLW. Density was estimated at 2 - 3/m^2 by Cameron (personal observation) and reported at 0.5 - 1.5/m^2 by Boes (1993). Additionally, the population of sea cucumbers at these locations included a significant number of small individuals that were probably one and two year class animals (Boes, personal observation; Cameron, personal observation; cf. Cameron & Fankboner, 1989). Furthermore, Cameron and Fankboner (1989) have observed localized areas in which numerous species of echinoderms with planktonic larvae regularly "recruit." These areas, which are generaly quite rare in relation to the distribution of adult habitat (Cameron and Fankboner, 1989) were not observed to be either physically or biologically unique, nor were they isolated in any observable way. It is most likely that prevailing current patterns concentrate the larvae of these echinoderms within the area until they are competent to metamorphose and settle to the bottom. Insufficient information is available to fully assess the importance of this area as a probable nursery for juvenile sea cucumbers, but the observations did occur for two consecutive years.

These sea cucumbers are similarly common at other locations in the area, but without the abundance of juvenile animals. The sea stars *Evasterias* and *Pycnopodia* were also quite common, and several individuals of the green sea urchin *Strongylocentrotus drobachiensis* were observed. Fur-

Figure 3-3
Location of Proposed Log Transfer Facilities



Source: Cameron 1992

thermore, a "pod" of juvenile red king crabs was observed in the shallow subtidal in the area. The juvenile crabs represent a chance observation of mobile organisms.

North Poison Cove LTF Site

Poison Cove, which is to the south of Ushk Bay on Peril Strait, is much smaller than Ushk Bay and is presently being used as a log-storage area. The North Poison Cove site is at the north lip of the mouth of Poison Cove, and is exposed to open water to the east and north. The beach here is a cobble-pebble mixture of apparent alluvial origin with a very shallow slope. The gentle slope continues throughout the intertidal and into the shallow subtidal to a steep bench at approximately 6 feet below MLLW.

The remainder of the subtidal is intermediate in slope with the substrate being similar to the intertidal with the addition of some sand and considerable shell debris i.e., valves of dead clams etc. This site is just to the east of an active log storage area and the bottom from a depth of 6 feet to 45 feet below MLLW was strewn (approximately 10 percent coverage) with wood debris (small clumps or isolated pieces) assumed to have originated with the transport and storage of logs within Poison Cove. The subtidal is quite luxuriant in algae growth indicative of moderate current flow. Of importance to note is that very large algae such as *Laminaria* sp. were often attached to large cobbles. Maximum current speeds for both ebb and flood tides are reported to be 1.8 knots to the west of Povorotni Island, and current speeds of this magnitude at this site would probably wash away large macro algae attached to cobbles.

South Poison Cove LTF Site

The proposed LTF inside the south lip of the mouth of Poison Cove is considerably different from the one opposite it. The intertidal is composed of exposed bedrock and boulders of varying sizes, and the site faces directly into the relatively open waters of Deadman Reach and the mouth of Hoonah Sound. The slope is quite variable, with some nearly vertical faces both to the east and west of the proposed LTF. Within the subtidal, the rock - boulder combination continues to approximately 6 feet below MLLW. Here as at the south Ushk Bay site, the bottom is dominated by cobbles interspersed with shell debris. Different from the Ushk Bay site, there are some large outcrops of bedrock on the east side of the area surveyed.

While this site could be expected to be exposed to occasional heavy wave or current action, the biological community within the intertidal is composed of organisms generally found on relatively protected rocky shores and is quite similar to the community at the proposed LTF site in Ushk Bay. While subtidally it appears that this area experiences regular mixing and flushing of

Poison Cove: presently used as a log-storage area and proposed as an LTF site.

its surrounding waters, (no accumulation of wood debris as observed at the South Poison Cove site), the subtidal biological community suggests that prevailing conditions are those consistent with relatively protected rocky beaches.

A proposed LTF site west of this site was examined in 1986 (Hughes et al. 1986). Moderate currents were noted and no significant accumulation of bark debris from log storage activities was observed. Montgomery and Berg (1977) report both commercial and sport fishing and shellfishing activities within Poison Cove. Crab pots placed as part of this survey trapped Dungeness and lyre crabs.

Goal Creek LTF Site

The proposed LTF at Goal Creek is located on Peril Strait on the north shore of a large alluvial fan of cobbles and pebbles forming the intertidal beach. The beach at Goal Creek is quite extensive, and the slope, while generally very gentle, is also quite variable. On the north shore of this beach there is a berm separating a gently sloping area that proceeds beyond the water line into the subtidal. Behind the berm to the south, the elevation of the beach decreases, forming an extensive intertidal basin that in the north is drained by a channel through the berm to the east of the proposed LTF. Within the subtidal the substrate has a moderate slope extending into the depths. The substrate at this location is composed of mainly sand with some pebbles, cobbles, and shell debris.

Of special interest at this location was the occurrence of the large sea pen, *Ptilosarcus gurneyi*. This sea pen is a filter-feeding colonial anthozoan (cousin to sea anemones) generally found in current-swept areas.

Deep Bay LTF Site

The proposed LTF at Deep Bay lies on the south shore of the bay approximately 0.6 mile from its head and is very protected from exposure to open water. The intertidal at Deep Bay is quite variable. An extensive beach flat composed of small pebbles and cobbles lays to the west of the LTF sites, while in the east a narrow bedrock and boulder beach extends to the water line. Within the shallow subtidal the bottom is composed of mud, sand, and shell debris. The slope of the shallow subtidal is generally moderate, but at a depth of approximately 50 feet below MLLW it flattens out. The bottom in this area is very silty and formed predominantly of mud with some pebbles mixed in. The bottom sediments are very loosely packed, and, at the time of the dive, it was possible for a diver to extend an arm into the substratum to a depth of more than 18 inches with little resistance. Also at this time, water clarity was greatly reduced at this site, as there was a considerable amount of flocculent material suspended in the water column. In general, this area appears to be a depositional area where very fine sediments are accumulating relatively undisturbed. Tidal flushing is probably a very insignificant process at this site.

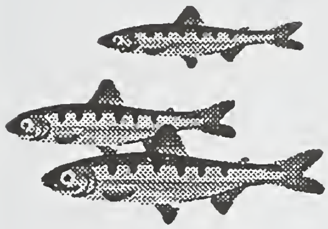
Deep Bay, in fact, is not deep. NOAA navigational charts show Deep Bay to have a uniformly flat bottom approximately 65 feet in depth throughout the majority of its limits. This was verified by a bathymetric survey of the proposed LTF. Furthermore, as part of the general scuba survey of this site, divers swam a transect perpendicular to the shore on the bottom for what was estimated to be 400 to 500 feet in length. Once the slope of the shoreline flattened out, the bottom remained uniformly very soft as described above. While swimming this transect, a single adult red king crab (*Paralithodes camtschatica*) was observed, as well as two specimens of the giant scallop (*Patinopecten caurinus*). It is expected that the physical and biological conditions encountered at the proposed LTF in Deep Bay are representative of the bay in general.

Commercial and sport fishing and shellfishing are reported within Deep Bay (Montgomery and Berg 1977). Crab pots placed in Deep Bay during this survey trapped Dungeness, lyre, Tanner, and red king crabs. A U.S. Fish and Wildlife Survey of Deep Bay in 1983 reported good quality habitat for Dungeness crab at the head of Deep Bay.

General Considerations

In addition to the scuba diving that was done on the specific sites of interest, five reference dives were made at areas not considered as sites for LTFs (see Figure 3-3). Since the placement of an LTF within Ushk Bay proper is a highly controversial issue, four additional sites within Ushk Bay, other than the proposed LTF, were surveyed. Additionally, a site within Peril Strait on the southwest shore of Povorotni Island was examined. The intent here was to observe the nature of the biological communities at these other locations to determine if some resource observed at a particular location was rare or otherwise limited. No quantification of resources was attempted at these sites.

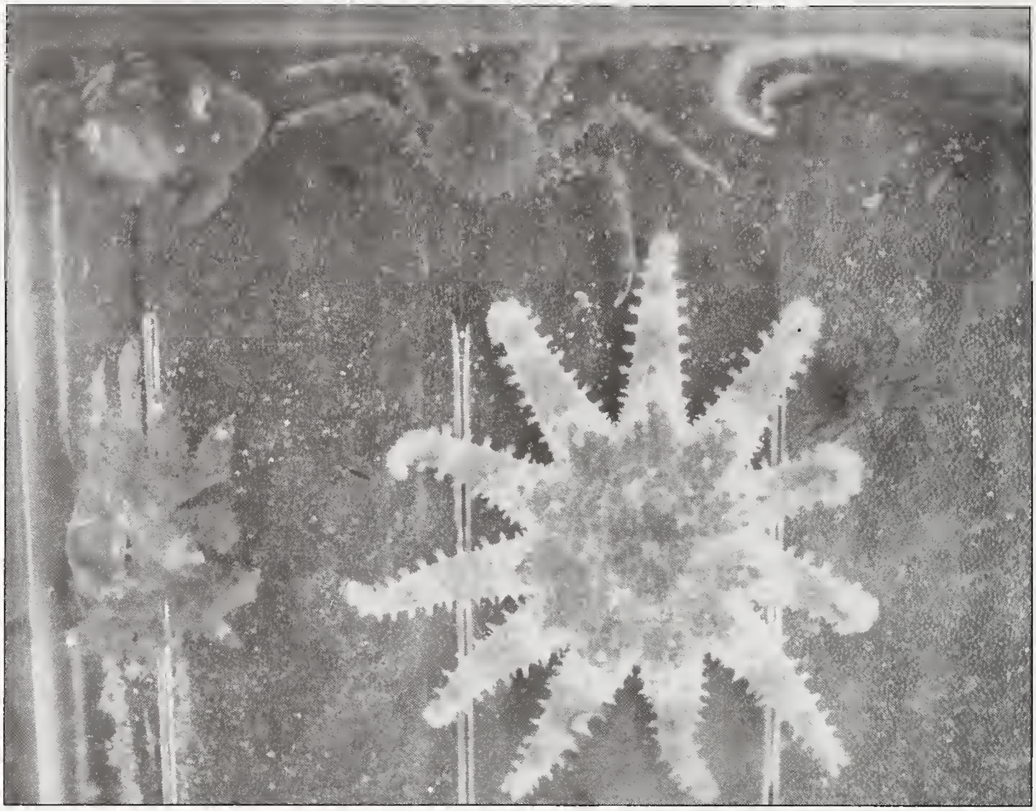
Furthermore, during periods of extreme low tide (approximately -3 feet) surveys of the shallow subtidal and intertidal were accomplished from a small boat motoring along the shoreline for much of the central portion of the north and south shores and the head of Ushk Bay, all of Poison Cove, and a portion of the north shore and head of Deep Bay.



In all of this survey work, the communities encountered were considered typical of those expected for similar habitats as observed throughout the waters of the Pacific Northwest. Significant observations of the presence of commercially important crabs were limited to the observation of a pod (dense aggregation of more than 100 individuals) of juvenile red king crabs within the shallow subtidal while surveying the north shore of Ushk Bay to the east of the bend, and the presence of considerable numbers (unquantified) of Dungeness Crabs at the head of Ushk Bay. Additionally, dense aggregations (greater than 3 animals per square yard) of the California sea cucumber *Parastichopus californicus* were noted right to the water line during tides lower than -3 feet and into the shallow subtidal. This sea cucumber presently is the focus of a limited but expanding fishery within Southeast Alaska. In general, the areas selected for the possible construction of LTFs are not different, biologically, from the surrounding areas.

To the east of the bend on the south shore of Ushk Bay, there is an intertidal headland whose biological community is different from any encountered elsewhere within our study. This area is directly exposed to a large expanse of open water from the east, and the intertidal community observed is more typical of that found on exposed rocky beaches. Indicator organisms include the barnacle *Semibalanus cariosus*, the chiton *Katharina tunicata*, and the anemone *Urticina crassicornis*. Each of these organisms is commonly found on exposed rocky beaches. In addition, the growth characteristics of *S. cariosus* are a qualitative measure of the level of exposure on a particular beach. Barnacles in high numbers growing side-by-side forming tall (2 to 3 inches) cylindrical individuals (as seen at this site), as opposed to shorter more conical forms, are indicative of areas generally exposed to heavy wave action (Kozloff 1983).

The significance of this observation is that both this site and the South Poison Cove site are very similar in substrate and exposure. The proposed site at Poison Cove generally faces north, and at the east side of this site there is a bedrock and boulder headland forming the east limit of the intertidal area surveyed. This headland faces to the east as does the headland in Ushk Bay described above. The entire Poison Cove headland, including the portion surveyed, is inhabited by organisms indicative of relatively protected rocky shores. The barnacles present include *Balanus crenatus* and *Balanus glandula*, both of which are common to protected areas. Therefore, while this site would seem to be potentially exposed to open water, the biological community reflects a more protected environment.



Typical benthic animals include: Alaska king crab (juvenile), mottled star, rose star, decorator crab, hermit crab in sponge house, and rhinocerous crab.

Soils and Geology

The combination of climate, geology, and topography has contributed to the development of the soils within the watersheds of the Ushk Bay Project Area, and provides the framework for the processes which impact soils productivity and water quality. The climate is characterized by high levels of precipitation and relatively cool temperatures. The geology is complex and active tectonically, resulting in a wide variety of rock types, extensive faulting and jointing, and relatively rugged mountains. The topography is dominated by the results of carving of the rugged mountains during glaciation. The glaciers also deposited soils over portions of the bedrock. Erosion and mass wasting have resulted in the removal, reworking, and redeposition of the parent materials.

Steep, high energy stream in a v-notch typical of the area.

The relatively rapid and recent uplift of the steeply carved glacial terrain has resulted in a landscape where high rates of erosion and mass wasting have formed very steeply sided, V-shaped dissections in the valley walls. These V-notch drainages are found on the headwaters and side slopes of all but the smallest watersheds in the Project Area. Most V-notches form along slight topographic features associated with underlying contacts, faults, joints, foliations, or other zones of weakness on the valley walls. The V-notches typically have very high rates of erosion, and function as high energy chutes for runoff, mass wasting debris, and snow avalanches.

In general, the heads of the medium to large drainages in the area formed on high, broad, ridge- top swales and V-notch chutes. The gradients of the uppermost channels are generally steep and are prone to snow slides and debris avalanches. Most of the higher ridges are covered with thin organic soils, muskeg, and sparse, dwarfed trees which lie on shallow bedrock. In these areas, the channels are generally shallow and run directly on bedrock. The channels become more deeply incised where they dissect glacial till or zones of weaknesses in the rock. If the introduction of avalanche debris in the channel is balanced with the steepness of the channel and its ability to flush the debris down to its lower reaches, then the channel achieves a dynamic equilibrium between erosion and deposition. However, the highest reaches of most valleys are eroding, and their stream channels are frequently swept clean of debris. In some cases, the headwater V-notches appear to be relatively stable, with mature evergreen trees lining the slopes above the channel. Due to the very nature and occurrence of avalanche debris in V-notch drainages, essentially all V-notches have the potential for renewed failure whether they appear to be currently active or relatively inactive. V-notch drainages present a significant hazard of slope failure, which would affect the forests and streams.

The soils were created as a result of the weathering of the parent bedrock, glacial soils, and alluvium, and the addition of organic matter. The characteristics of the soils influence in part, the types of vegetation, the extent of surface erosion and mass wasting, and in turn impact the productivity of timber and fish resources.

Many of the slopes above the low- to mid-valley level are steeper than the natural angle of stability of the soils that are present. The soils that exist on the oversteepened slopes are usually thin and shallow, typically less than a few feet thick. On the lower hillsides and on the edges of the valley bottoms, thicker sections of transported soils have accumulated as a result of erosion and mass wasting. In the valley bottoms, reworked alluvial sands and gravels have been deposited.

The productivity and stability of soil are primary concerns for the successful long-term management of a forest and the productivity of watersheds. The loss of soil that is capable of supporting plant life results in an increase in the length of time that it takes biological systems to recover from disturbances. Moreover, the physical removal of the soil by erosion and mass wasting can result in the long-term reduction of plant and animal habitat, scarring of the landscape, and siltation of streams, which can adversely impact fish habitat.

Soil Productivity

Some of the factors that affect the productivity of soils include the type of material, climate, topography, and vegetation. The types of soils, topography and associated plant life found in the Ushk Bay Project Area were investigated and the results tabulated by the Forest Service in the Land Systems Inventory.

The composition of the soil depends on the bedrock parent material from which it was derived and the subsequent geologic history through which it passed. Most of the soils in Southeast Alaska are relatively young and immature soils which have been transported locally or from great distances by down-slope movement, fluvial action, and by glaciers. Some soils in the area are residual and have formed in place from the physical and chemical weathering of the parent bedrock. The weathering of bedrock and the composition of the resulting residual soil depend greatly on the physical characteristics of the rock, the chemistry of the rock and surrounding environment, and the local climate.

The temperate maritime climate in Southeast Alaska typically results in cool air and soil temperatures, short growing seasons, and significant rainfall. In these conditions, organic soils tend to decompose slowly and build up from inches to tens of feet thick, especially on poorly drained low-angle slopes and flat ground. On steeper slopes, the fibrous organic mat helps to absorb rainfall and reduce runoff, erosion, and the leaching of nutrients from the soil. However, without the protective organic cover, exposed mineral soils are quite susceptible to erosion and mineral leaching in the wet environment.

The overlying vegetation, or lack of it, also influences the productivity and development of the soil. A thick forest canopy can reduce the amount of solar energy and warmth reaching the forest floor which tends to reduce the productivity of the soil. A thick surficial vegetative mat also provides thermal insulation to the underlying mineral soil and insulates it from the winter cold and the summer warmth, allowing prolonged seasonal tree growth.

Geotechnical Characteristics

The soils on the valley sides within the project area are generally thin, sometimes only a couple of feet thick, poorly developed, and poorly drained from a geotechnical point of view. Four primary types of hillside soils were noted as follows.

- Surficial organic soils where the organic mat ranges in thickness from 0.25 to 2 feet in general, and occasionally up to 3 feet and more in boggy areas. The organic layer usually lays on relatively impermeable soils or bedrock and often contains the groundwater table. The organic soils are readily subjected to soil creep on moderate to steep slopes.
- Muskeg occupies approximately one-fifth of the Project Area. Muskeg soils are occasionally found on sloped areas and generally form in wet conditions on relatively impermeable soils or bedrock. Muskeg wetlands occupy a significant portion of the Project Area, particularly on the lower valley-side benches and at higher elevations along with alpine meadow plant associations. The higher elevation muskegs tend to form on moderately sloped ridge lines where they are relatively thin and overlay bedrock. Muskeg is also frequently found on moderately sloped lower valley sides and benches. The lower elevation muskegs tend to form on the relatively impermeable compact till and on bedrock, which was probably formerly exposed by glaciation. The lower elevation muskeg tends to be thicker, occasionally up to tens of feet thick. The relatively saturated organic soils that make up the muskeg are highly compressible and have very low soil strength. The thick side-slope muskegs exhibit stair-step topography, inward sloping benches with intermediate oversteepened slope breaks, and bulging bases. These features indicate that soil creep and earthflow processes are occurring. Earthflows are generally slow moving landslides that move intermittently downslope at rates of inches to feet per year. Due to their compressibility and instability, muskeg soils present constraints for logging activities and development. Wetlands and riparian soils commonly associated with muskegs are described in more detail in the Vegetation section of this chapter.
- Silty residual and colluvial soils generally range in thickness from 0.25 to tens of feet. The residual and colluvial soils are typically quite silty and fine grained, but also include silty sands and silty gravels. The silty residual and colluvial soils tend to be moist to wet, and occasionally plastic. Some of the plasticity of these soils can be attributed to mixed interlayers of air-fall volcanic ash from the volcanoes on Kruzof Island which lie just to the south of Chichagof Island. Numerous stair-stepped soil slumps exist on moderately sloped ground that contains mixed sequences of interlayered organic and silty soils.
- Compact, silty, fine-grained glacial till ranges in thickness from being relatively thin when present on some of the mid-valley sides, to tens of feet in the lower reaches of some of the valley bottoms. The compact till is predominately a silty sand with occasional fine gravel and rare coarse gravel, cobbles, and boulders. The compact till is generally over-consolidated, dense, and relatively impermeable. The soil tends to be moist to saturated. The compact till is underlain by bedrock and overlain usually by organic soils and occasionally by silty residual and colluvial soils. The till can result in slope instabilities throughout the sloped portions of the project area.

Geologic Hazards

Geologic hazards that could affect the Ushk Bay Project Area include erosion, mass wasting, snow avalanches (the effects of which are generally considered with mass wasting), volcanic activity, and earthquake activity. The probability of destructive volcanic activity in the area is low, and the probability of destructive earthquakes is unknown.

Seismic Hazard

The Ushk Bay area lies in Zone III of the US Army Corps of Engineers modified seismic probability map. This is the most hazardous zone. It is listed as having a largest probable earthquake magnitude of greater than 6.0 on the Richter scale, and as being in the major category of possible maximum damage to structures. The closest major earthquake had a magnitude of about 7.1, and it occurred in 1927 approximately 20 miles northwest of the area. Other nearby earthquakes in Southeast Alaska have had magnitudes recorded up to 8.6 (Yehle 1974). Some of the possible effects from nearby major earthquakes include the following:

- Sudden ground movement and shaking.
- Ground uplift or subsidence.
- Compaction and settling of loose soil deposits.
- Liquefaction of nearly saturated, loose, fine-grained soils.
- Avalanching and landsliding of liquefied or loose soils, rocks, and road fill on moderate to steep slopes.
- Flooding, bank erosion, breakout erosion, and rerouting of creeks dammed by earthquake-induced landslides.

Erosion and Mass Wasting

Erosion is the movement of individual soil particles by the action of wind or water. Mass wasting is the downhill movement of soil masses by the force of gravity, and it is the dominant process of slope reduction and degradation in Southeast Alaska. Mass wasting events can range from being small and insignificant, to major catastrophic disasters. They can occur over great lengths of time and be imperceptibly slow like soil creep, or can be practically instantaneous like avalanches. Types of mass wasting events include soil creep, soil slumps, landslides, mud flows, debris flows, debris avalanches and torrents, rock falls, and snow avalanches.

Mass wasting processes were probably the most active shortly after the retreat of glaciers from the Project Area. Oversteepened glaciated slopes tended to fail along zones of weakness. The eroded materials were transported into the tributaries, main channels, and valley bottoms. Significant amounts of mass wasting continues today but probably not as much as during the initial post-glacial period. Conditions such as large storm events (which can lead to windfall), the undercutting of the base of a slope, or the loss of root strength on a steep slope may cause the loss of apparent soil cohesion and initiate a failure. Once a failure occurs, rilling and continued sloughing of the headwall can lead to a headward-propagating V-notch channel. The headward propagation at the top of the failure may lead to a succession of failures and the formation of a debris avalanche chute as the failure lengthens and migrates upslope towards the ridgetop.

Failures tend to be triggered during or after seismic events, wind storms, springtime melting, and heavy precipitation that normally occurs in the Project Area during the fall and spring seasons. High precipitation and saturated conditions produce high pore-water pressures in the soils that exceed the strength of the soil and lead to failure. During these periods of high runoff, stream flows are also elevated, which causes high rates of erosion along the channels, stream banks, and side slopes of the channels and hillsides.

The stability of the soils in the Project Area appear to have been significantly affected by the presence of air-fall volcanic ash from past eruptions of volcanos upwind. The volcanic ash affects the characteristics of the soils, making them behave in a "plastic" manner, thereby resulting in a higher occurrence of soil creep and landslides in comparison to less plastic soils.

In addition, clay deposits derived from glacial melt during past ice ages have been uplifted up to 500 feet in elevation by isostatic rebound as the glaciers disappeared. These areas may also be susciptible to higher incidence of soil creep and landslides.

Soil creep is the slow downhill movement of soil and loose rock material on a slope. The creep is a reflection of the internal angle of friction being exceeded. Soil creep can also be a precursor to larger scale earth movements such as landslides. The mid to higher elevation, moderately steep to very steep slopes in the Project Area are subject to soil creep. Along with other features, soil creep is evident by J-shaped tree trunks which bend as the trees attempt to grow upward on soils moving down-slope. Soil creep appears to be a dominant mass-wasting process on the generally poorly drained, organic-rich soils in the Project Area, particularly on moderately steep and steeper hillsides, or those having a grade greater than about 65 percent. In general, well-drained soils did not exhibit significant soil creep on slopes less than grades of about 85 percent. However, essentially no well-drained soils from a geotechnical point of view were observed in the Project Area above the valley bottoms on the slopes where creep is a concern.

Numerous landslides and slide chutes exist in the Project Area. A few very recent ones were observed to be less than a year or two old and were still active. They were generally shallow, 3 to 8 feet thick, and moderately small, 50 to 100 feet wide and 100 to 300 feet long, as can be expected in the uneven, relatively young terrain which has only a thin veneer of soil over bedrock on the steeper hillsides. The causes of failure are typically related to oversteepened hill slopes or to failures at the toes of the slopes. The failures can be exacerbated by glacially carved bedrock surfaces which decrease the friction between the soil and bedrock.

A mass movement hazard ranking system was generated based on field truthing of relevant data within the Chatham Area Land Systems Inventory. Four categories of mass movement are included, ranging from Hazard Rating One which reflects "low" hazard, to Hazard Rating Four which reflects "extreme" hazard. The methodology and ranking of the mass movement hazard are presented in Appendix F.

Mineral Resources

None of the known metallic mineral prospects found in other parts of Chichagof Island are located in the Ushk Bay Project Area. The only known recorded production from the Island came from several of the occurrences outside the Project Area, all of which produced either gold or silver. Of sixteen prospects explored between 1901 and 1977, none found economic deposits. Seventy nine claims were staked between 1901 and 1947, and all were abandoned. In 1974, 60 more claims were staked, which were abandoned after 1977. Two other prospects were explored in the early 1980s and have also been abandoned. Although the Project Area seemed to be conducive for ore minerals because of its geologic history, only a few localities of trace amounts of disseminated pyrite were observed during field reconnaissance in 1992.

In considering the possibilities for borrow-source materials, practically the only observed clean sand and gravel deposits were located in the existing stream channel systems. The igneous bedrock and the more competent metamorphic bedrock could be considered as a source of borrow material for road construction, using typical quarrying and crushing techniques.

Karst Topography

The U.S. Geological Survey has mapped an area along the western boundary of the Project Area that contains or includes limestone mixed with shales and slates. These areas have potential for the occurrence of caves. No cave resources have been documented in the Project Area and field work done for this analysis failed to discover any caves.

Recreation

The vast area of Tongass National Forest in Southeast Alaska provides a wide variety of opportunities for recreational experiences. Rugged mountains and fiords carved by glaciers are separated by thousands of miles of inland waterways and shoreline, and large populations of fish and wildlife. Highly scenic natural landscapes provide spectacular settings for all kinds of recreation activities including, but not limited to, saltwater and stream sport fishing, crabbing, hiking, big game and water fowl hunting, pleasure boating, sea kayaking, sight-seeing, wildlife viewing, beachcombing, and gathering forest products.

The Project Area is composed of approximately 44,503 acres of land, approximately 113 acres of freshwater in three small lakes, and approximately 36 miles of shoreline (not including several small offshore islands and rock outcrops). The Project Area contains two small private land inholdings with cabins. Approximately 321 acres of land along the shoreline of Ushk Bay have been previously harvested.

Steep, rugged terrain and dense vegetation generally confine most recreational activities to shoreline areas, bays, and coves that can be accessed by boat. The Project Area cannot be accessed by road. The only other access into the area is by float planes which can land on the relatively calm waters of bays.

The area within an approximately 15 to 30-mile radius of communities or towns in Southeast Alaska is called the home range. The Forest Service uses the home range as a way to describe the potential user groups of recreation places and sites. The closest community to the Ushk Bay Project Area is Sitka, located approximately 30 miles to the south. Although the Project Area is located at the outer limit of the home range of Sitka, it is popular with overnight users and commercial fisherman (pers. comm. 1992). The Project Area is outside the home range of Angoon, a much smaller community located approximately 40 miles to the east.

Recreation Opportunities

Recreation opportunities in the Ushk Bay Project Area have been inventoried using the Recreation Opportunity Spectrum (ROS). The ROS was developed by the Forest Service to analyze and describe the physical setting and the recreation use and experience as factors that affect the availability and quality of recreation opportunities (Forest Service, 1982). The ROS system portrays a range of recreation activities, settings, and experiences from primitive to urban. Opportunities in the various classes depend on a variety of factors, including access, facilities present, amount of modification to the natural environment, and the opportunity for isolation, risk or self reliance. ROS classes contained in the Project Area include three of the five defined by the ROS: Primitive, Semi-primitive Non-motorized, and Semi-primitive Motorized (see the Glossary for full definitions). Table 3-25 shows the acres of each ROS class by VCU.

Recreation opportunities in the Project Area are largely primitive because access is limited to boat or float plane. Seventy five percent of the Ushk Bay Project Area is currently in the Primitive ROS Class. Other than a short timber harvest access road at the head of Ushk Bay that is densely overgrown with alder, there are no roads in the Project Area. Shoreline areas were inventoried as Semi-primitive Motorized (SPM) because of the influences of pleasure boat, tug, and ferry traffic on Peril Strait. Except for a few big-game trails, dense understory vegetation largely restricts use to shoreline areas.

Recreation Places

Recreation places are defined as areas of land and water with inherent characteristics that facilitate recreation activities like boating, hiking, stream and saltwater fishing, hunting, wildlife viewing, sightseeing, and other activities that are not limited to a particular site but can occur throughout an area. These places may be associated with beaches, streams, trail corridors, alpine meadows, cabins, lakes, campgrounds, picnic areas, or anchorages. Recreation Places are defined not just by the specific site, but by the geographic area that is important to the present ROS setting around the site.

Visitors access the project area by boat or floatplane

Recreation places in the Project Area are generally limited to shoreline areas because access to inland portions is restricted by the absence of roads, the difficult terrain, and dense forest vegetation. Ushk Bay, Poison Cove, and Deep Bay all provide recreation places because their waters are relatively protected from the turbulence in Peril Strait. Water turbulence caused by currents, winds, and tug, barge, and ferry traffic makes it difficult and treacherous to access most of the shoreline along the Strait. Consequently, the relatively calm waters of the bays tend to provide boats and float planes with the best access to recreation opportunities in the Project Area.

The Project Area contains a total of seven recreation places identified during the inventory (Figure 3-4 and Table 3-26), all of which can be accessed only by boat or float plane. These recreation places and their associated recreation sites provide a wide variety of recreation activities including: viewing scenery, viewing wildlife, boating, canoeing/kayaking, saltwater fishing, stream fishing, big game hunting, beachcombing, dispersed camping, waterfowl hunting, and gathering forest products. In addition, these places provide some protection from foul weather.

Recreation sites are the specific sites or facilities within a recreation place where recreation activities are localized. Recreation sites include anchorages, trails, picnic sites, campsites, Forest Service cabins, and significant natural features like waterfalls or geologic formations. Except for a picnic site located on the isthmus on the north side of Ushk Bay, the only recreation sites in the Project Area consist of a few anchorages. The anchorages in Ushk Bay seem to be the most popular because the shape of the bay and the steep surrounding mountain terrain provides the best protection from wind and bad weather. An anchorage between Little Island and the south shoreline of Deep Bay provides a good place for small boats to escape the hazards of bad weather and severe water turbulence. Other anchorages in both Poison Cove and Deep Bay are somewhat more exposed. Although other shoreline areas show use, the use appears to be occasional and does not seem to indicate regular use as expected at a recreation site.

Table 3-25.

Acreage in Existing ROS Classes in the Ushk Bay Project Area

VCU	Primitive	Semi-Primitive Non-Motorized	Semi-Primitive Motorized	Total
279	107	4,847	2,552	7,506
280	15,240	1,085	371	16,696
281	18,048	0	2,253	20,301
Project Area	**33,395**	**5,932**	**5,176**	**44,503**
Percent of Total	75	13	12	100

Source: Gault and Frank, 1992

Recreational Use

Except for a few miles of overgrown road at the head of Ushk Bay, the Project Area is unroaded. Access to recreational opportunities is entirely dependent upon boats and float planes. Located at the outer edge of the home range (approximately 30 miles) of Sitka, Alaska, the Project Area generally receives a moderate level of use, as compared to recreation use in Southeast Alaska, in general. Peril Strait is a narrow waterway heavily used by recreational boaters, tugs and barges, and the Alaska Marine Highway. Recreation places and sites in the Project Area are frequented primarily by residents and visitors to the community of Sitka as they pursue opportunities to participate in the wide variety of available recreation activities (refer to Table 3-26).

The protected waters of Deep Bay and Ushk Bay provide good anchorages and safe access to shoreline and beach fringe areas. The most popular among recreation activities are crabbing and saltwater fishing in Deep Bay and Ushk Bay, and to a lesser extent in Poison Cove, and big-game hunting along the shoreline and to some extent, inland. Other activities in the area include waterfowl hunting, beachcombing, stream fishing, wildlife viewing, and sightseeing. The majority of visitors to the Project Area are travelers on the Alaska Marine Highway ferry who are going past the area, but public comment suggests the area is heavily used by Sitkans.

The Alaska Marine Highway ferry system provides regular service between Sitka and Juneau through Peril Strait, offering visitors opportunities to experience Southeast Alaska and "the feeling of vastness, wildness, and solitude" it imparts on visitors (USDA Forest Service 1991d). Approximately 104,500 passengers travelled on the ferry through Peril Strait between Sitka and other destinations in 1990, providing visitors with opportunities to view the Ushk Bay Project Area (State of Alaska 1991).

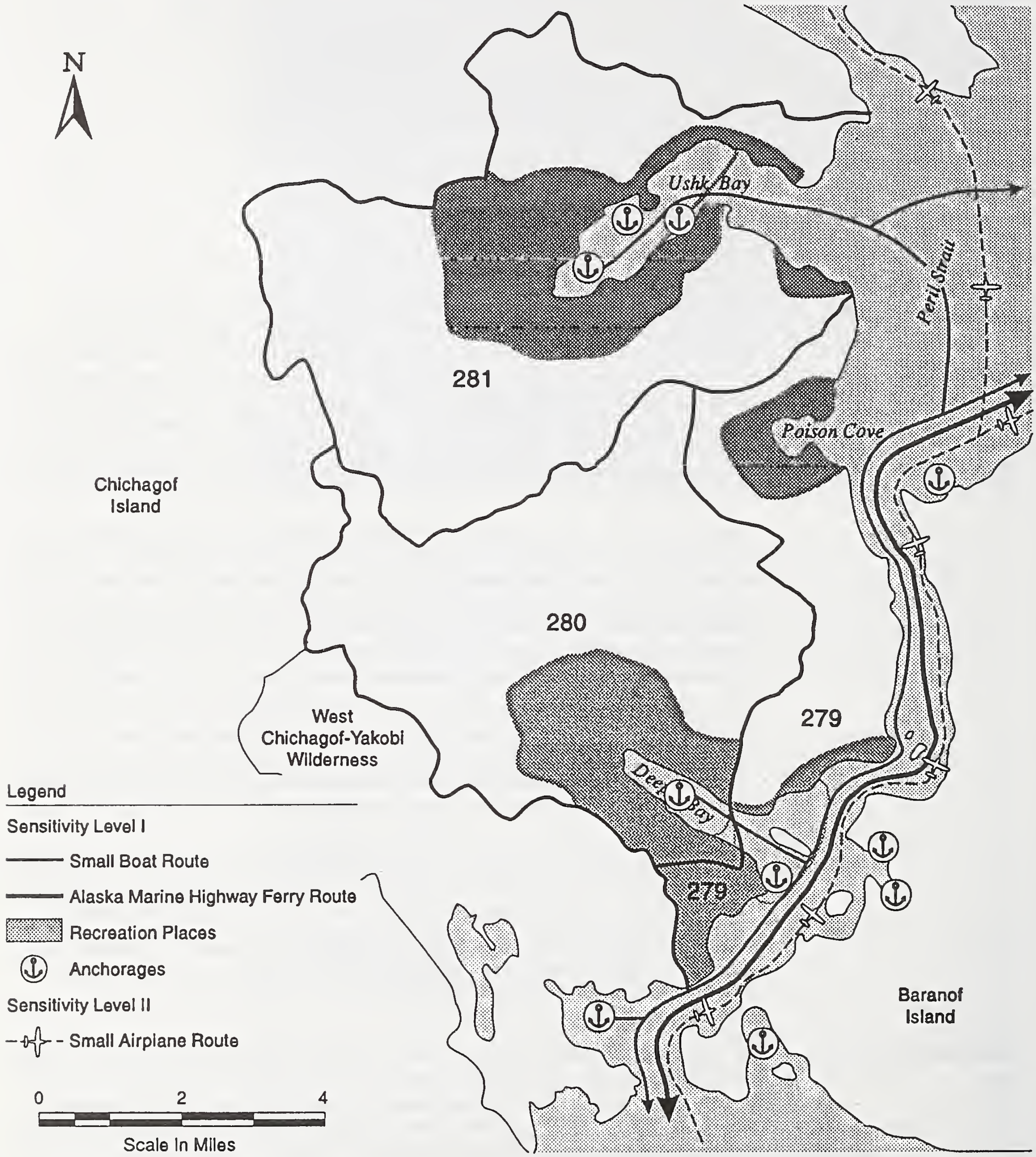
Outfitter and guide services offer visitors opportunities to access remote inland and shoreline areas for big-game hunting and stream fishing, wildlife viewing and photography, and other activities. There are eight outfitter/guides holding permits in the Ushk Bay Project Area.

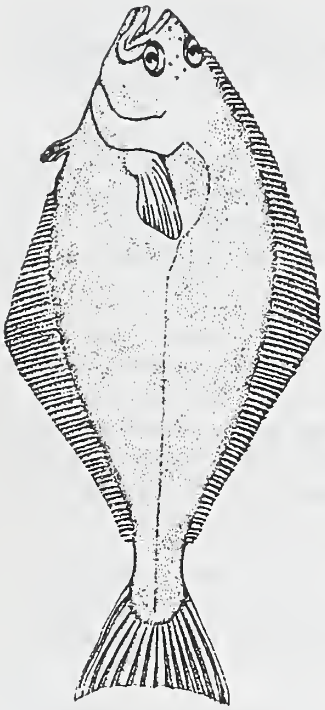
There are two cabins located on private land inholdings in the Project Area, but they are not available for public recreation use. One is located on the north shoreline of Poison Cove in VCU 279, the other is located at the head of Deep Bay in VCU 281.

Recreation Use by VCU

VCU 279 - This VCU extends along the shoreline of Peril Strait from just south of the mouth of Deep Bay to just north of Poison Cove. Recreation use in this VCU was inventoried as low because of the difficulty in accessing shoreline areas along Peril Strait and limited recreation opportunities in Poison Cove and the portion of Deep Bay in this VCU. Poison Cove and the mouth of Deep Bay are the only shoreline areas that can be easily accessed by boat. Much of

Figure 3-4
Visual Sensitivity and Viewpoints





the shoreline along Peril Strait is abrupt and rocky, making it very difficult and dangerous to attempt to anchor or moor boats. Water turbulence from natural currents and boat, tug, and ferry traffic make shoreline access nearly impossible except at a few areas where creeks have made alluvial deposits.

Poison Cove is frequently used for log raft storage, which deters much of the potential recreational use of this bay. Poison Cove is exposed to turbulent waters caused by wind and boat traffic in Peril Strait, making this bay less desirable for anchorage than other bays in the area. However, a large tidal flat at the head of Poison Cove provides some opportunities for waterfowl hunting and the beach fringe provides opportunities for deer hunting.

Table 3-26.

Recreation Places and Sites in the Ushk Bay Project Area

VCU	Recreation Place No.	Local Name	Activities	Recreation Sites	Acres
279	31080.01	Sergius Narrows	view scenery and wildlife, boating, saltwater fishing, big game/waterfowl hunting		409
279	31101.01	Poison Cove Shoreline	view scenery and wildlife, boating, canoeing, kayaking, saltwater and stream fishing, big game hunting	anchorage	542
279	31101.02	Poison Cove	view scenery and wildlife, camping, big game hunting		505
279/ 280	31082.01	Deep Bay Shoreline	view scenery and wildlife, boating, saltwater and stream fishing, big game/ waterfowl hunting	anchorage	932
279/ 280	31082.02	Deep Bay	view scenery and wildlife, boating, saltwater fishing, waterfowl hunting	anchorage	1,595
279/ 280	31082.03	Deep Bay Uplands	view scenery and wildlife, camping, big game hunting		2,565
281	31102.01	Ushk Bay Shoreline	view scenery and wildlife, boating and kayaking, saltwater fishing, beachcombing, camping, big game hunting	anchorage, dispersed campsite	1,632
281	31102.02	Ushk Bay Uplands	view scenery and wildlife, camping, big game hunting		3,148
281	31083.01	Point Marie	view scenery and wildlife, beachcombing, camping, big game hunting		241

Source: Gault and Frank, 1992

Deep Bay is a popular recreation place for crabbing, sport fishing, and hunting; however, use of the area remains relatively low. This may be because Deep Bay offers few good anchorages for overnight users and the location of the area is near the outer limit of the home range of Sitka which tends to limit day-use.

VCU 280 - This VCU includes most of Deep Bay, the Deep Bay drainage, and the upper parts of the Goal Creek and Poison Cove drainages. Recreation use in this VCU was inventoried as low because the majority of this VCU is composed of upland areas that are difficult to access. The only shoreline area in this VCU occurs in Deep Bay which can be accessed only by boat or floatplane.

Good anchorages are available in Deep Bay when weather patterns in the area, more specifically wind direction, permit their use. When conditions are right, Deep Bay provides safe haven from severe weather conditions in Peril Strait and Salisbury Sound, and is sometimes used by recreational and commercial fishing boats. The beach fringe of Deep Bay provides deer hunting opportunities, and the large tidal flat at the head of Deep Bay offers some waterfowl hunting as well as salmon fishing opportunities. Though Deep Bay is a popular recreation place for crabbing, sport fishing, and hunting, recreation use of the area remains relatively low.

VCU 281 - This VCU includes Ushk Bay and its associated drainages. Recreation use of this VCU was inventoried as high. The recreation places in Ushk Bay are the most popular of all those inventoried in the Project Area. There are excellent opportunities for crabbing, fishing, and hunting.

Ushk Bay is very well known by local and regional recreation users. Surrounded by scenic mountains, upland areas, and tidal flats, the area is very attractive to recreation boaters for overnight anchorage. A popular anchorage is located southwest of a small internal isthmus. There is a picnic site located on the shore adjacent to this anchorage that is not visible from the water. Many locations throughout the bay provide access to the shoreline. Waterfowl and big game hunting is popular here. Hunters often access alpine areas from this bay, although difficult access keeps use of upland areas somewhat low. There is often an extensive network of commercial crab pots along the rear of the bay.

The Alaska marine highway ferry system carries passengers through Peril Strait adjacent to the Ushk Bay area.

The project area has the potential to provide a wide variety of recreation opportunities.

Recreation Demand

Recreation use has been steadily increasing on the Tongass National Forest over the last ten years. The biggest growth in recreation use has been in the Semi-primitive Motorized ROS category. These areas primarily include natural appearing shorelines, lakes, and rivers which provide for semi-primitive experiences, but are considered motorized because of access by motorized boat and/or floatplane traffic. This category comprises the primary recreational use of the Ushk Bay Project Area, with most use occurring along the natural-appearing shoreline of Ushk Bay and Deep Bay and access provided by boat and floatplane. Currently, the demand for all ROS classes, except Semi-primitive Motorized, is being met on the Tongass National Forest. The waterways of the Inside Passage continue to grow in popularity and remain the single most promoted attraction in Alaska. Generally, visitors to Southeast Alaska "expect to find it wild and 'unspoiled', while at the same time seek comfort and convenience" that requires development or roads and other infrastructure (USDA Forest Service 1991d).

The next largest component of recreation use on the Tongass National Forest is the Primitive and Semi-primitive non-motorized ROS classes. In these classes, recreationists use a natural or natural-appearing setting with little evidence of human and no motorized use. Although use of Primitive and Semi-primitive classes is low in the Project Area due to difficulty of access, this category of recreation use experienced the largest percentage increase in the Tongass National Forest over the last ten years.

Recreation Special Use Permits and Special Area Designations

Special use permits for recreation that have been issued in the Ushk Bay Project Area are held by outfitters and guides. There are several special-use permit holders in the Project Area. Outfitters and guides take parties into the Project Area hunting, sport fishing, crabbing, sight-seeing, and wildlife viewing and photographing. Access is provided by boat and sometimes by floatplane.

Special area designations in the TLMP as amended include Research Natural Areas, Special Interest Areas, and Wild and Scenic Rivers. There are no special area designations within the Ushk Bay Project Area, and none are being considered for designation in the Revised TLMP. However, the Project Area is located adjacent to the West Chichagof-Yakobi Wilderness.

Roadless Areas

Most of the Ushk Bay Project Area, except for the previously harvested areas along the shoreline of Ushk Bay, is part of the Hoonah Sound roadless area identified in the inventory presented in the TLMP Draft Revision. The Hoonah Sound roadless area is 93,880 acres, and is comprised of a number of VCUs in management areas C39 and C40, about 15 percent of which is in the Project Area. Roadless areas identified in the inventory may be considered for Wilderness recommendation or may be managed for a wide range of other resource management activities. Once an area is roaded it is generally no longer available for Wilderness consideration. To qualify for consideration as a Wilderness area, a roadless area must contain at least 5,000 acres or be contiguous to existing Wilderness areas. Roadless land in the Ushk Bay Project Area was allocated to Land Use Designations III and IV in the TLMP as amended. These land use designations allow for moderate to intensive development of the Project Area.

Visual Quality

An important aspect of Southeast Alaska's natural resource base is its attractive setting. The importance of the scenic splendor of the area is evident by increased tourism and a heightened awareness of and sensitivity to scenic resource values by Alaska's residents. The methodology used to evaluate the scenic qualities of the Ushk Bay Project Area is the Forest Service Visual Management System. The Visual Management System provides the framework within which to inventory the visual resource and provide measurable standards for its management. The inventories include determination of Visual Quality Objectives (VQOs) based on Sensitivity Levels I, II, or III with I being most sensitive; Variety Class A, B, or C with A being most distinctive; and distance / visibility zones of foreground, middleground, background, and unseen. Inventories also include Existing Visual Condition (EVC) which is divided into Types I throughVI showing increasing levels of past disturbance of the landscape.

A detailed description of the specific procedures and methods used in conducting the visual resource inventory is included in the Visual Resource Inventory Report for the Ushk Bay area (Gault 1992).

Ushk Bay is a popular anchorage and recreation place for some Sitka residents.

Visual Resource Description

VCU 279

This VCU includes the prominent shoreline area along Peril Strait from just north of Poison Cove to just south of Deep Bay. Most of the shoreline is highly visible to views from the Alaska Marine Highway ferry route, a route also used by many recreational boaters (see Figure 3-4).

Shoreline areas along Peril Strait, from Deep Bay to just south of Poison Cove area, are visible in the foreground distance zone from the Alaska Marine Highway ferry route (Sensitivity Level I) and from the primary small boat route. The hills and mountains above the shoreline of Peril Strait are visible in the middleground distance zone and are also visible from the ferry and primary small boat routes. The headlands and shoreline areas from Poison Cove to north of Ushk Bay are openly visible in the middleground distance zone. West of Poison Cove, there is a small portion of this VCU visible in the middleground distance zone from a small airplane corridor (Sensitivity Level II). The remainder of VCU 279 is unseen.

All of the VCU 279, except a small area of Class A and a small area of Class C west of Poison Cove, was inventoried as Class B. Of the total 7,506 acres inventoried in VCU 279, 127 acres were inventoried as Class A, 6,821 acres were classified as Class B and 558 acres as Class C. Definitions of variety classes are in the Glossary of this EIS.

Visual Quality Objectives (VQOs) for VCU 279 include: 23 percent Retention, 64 percent Partial Retention, 12 percent Modification, and 1 percent Maximum Modification. Definitions of VQOs are in the Glossary of this EIS and a map is included in Appendix G.

The existing visual condition is largely Type I (landscape appearing undisturbed) except a portion on the north side of Poison Cove around a private cabin inventoried as Type III. There has been no previous harvest in this VCU. Definitions of existing visual conditions are contained in the Glossary of this EIS.

VCU 280

This VCU is bounded on the west and south by the West Chichagof-Yakobi Wilderness. The only access into this largely inland area is through Deep Bay, which is partially encompassed by the VCU boundary. Deep Bay is a recreation place used primarily by residents of Sitka and visitors to the area for fishing, crabbing, and hunting (see Figure 3-4). The relatively calm waters of this bay provide boaters with places to anchor. A private cabin on a native land claim is located northwest of the large tidal flats of Deep Bay.

Only a few high alpine areas of VCU 280 are visible in the middleground and background distance zone from Alaska Marine Highway ferry route (Sensitivity Level I). Some portions of the eastern part of this VCU are visible in the middleground distance zone from a small airplane corridor (Sensitivity Level II) that roughly parallels the coast of Peril Strait. The remainder of this VCU is unseen.

In VCU 280, Variety Class A areas were inventoried in the alpine area several miles west of Deep Bay at the boundary of the West Chichagof-Yakobi Wilderness and in the alpine area a few miles north of the Bay. Class B landscapes were found throughout much of the sub-alpine areas and rolling hills of inland areas. A large area of Class C landscape occurs northwest of Deep Bay in a large inland valley in VCU 280. Of the 16,696 total acres in VCU 280, 1,666 acres were inventoried as Class A, 10,016 acres were classified as Class B, and 4,369 acres as Class C.

VQOs for VCU 280 include: 4 percent Retention, 43 percent Partial Retention, 30 percent Modification, 23 percent Maximum Modification.

The existing visual condition of the large majority of this VCU was inventoried as Type I, with a small area surrounding the private cabin at the head of Deep Bay as Type II (landscape slightly modified). There has been no previous harvest in this VCU.

VCU 281
This VCU includes Ushk Bay, a large protected bay that is well known for crabbing and other activities including fishing, hunting, and camping. Ushk Bay is a popular recreation place used by residents of Sitka and visitors to the area (see Figure 3-4).

Visibility/distance zone in Ushk Bay is somewhat limited. The immediately surrounding area is openly visible in the middleground distance zone from small boats (Sensitivity Level I) that enter the Bay for anchorage or recreation uses. Much of the inland area of this VCU is unseen except for a few high alpine areas that rise above the hills and mountains around the Bay. Some of the alpine areas are also visible in middleground and background distance zones from the Alaska Marine Highway ferry route (Sensitivity Level I). In addition, a portion of the alpine areas north of Ushk Bay are visible in the background distance zone from small boats in Hoonah Sound, north of the Project Area.

Variety Class A areas in VCU 281 were inventoried in the high alpine areas north, south, and west of the head of Ushk Bay. In addition, a Class A area occurs in a large, steep V-notch drainage just northwest of the tidal flat area of Ushk Bay. The remainder of the VCU along the shoreline of Ushk Bay and the lower rolling hills and bottomland areas of inland valleys was inventoried Class B, except for an area of Class C that occurs south of the head of Ushk Bay. Of the 20,301 total acres in VCU 281, 4,590 acres were inventoried as Class A, 15,052 acres were classified as Class B, and 659 acres as Class C.

VQOs for VCU 281 include 7 percent Retention, 59 percent Partial Retention, 32 percent Modification, and 2 percent Maximum Modification.

The existing visual condition of the majority of this VCU is Type I. Two relatively small areas of Type II were inventoried: one on the north side of the Bay surrounding a popular campsite, the other surrounding the abandoned road that extends west from the tip of the Bay for approximately 3 miles. An area on the southwest portion of the Bay, logged between 1956 and 1966, was inventoried as Type III. Approximately 321 acres of VCU 281 has been previously harvested.

Economic and Social Environment

Nearly 80 percent of Southeast Alaska is within the Tongass National Forest, an area larger than the State of West Virginia. This area stretches roughly 500 miles from Ketchikan in the southeast, to Yakutat in the northwest, and is mainly unpopulated wild country. Presently, only about 69,000 people live in 33 towns, communities and villages located in or very near the boundaries of this, the largest Forest in the National Forest System.

The economies of most communities in Southeast Alaska depend almost exclusively on the Tongass National Forest to provide natural resources for uses such as fishing, tourism, recreation, timber harvesting, mining and subsistence uses. There is very little private land to provide these resources. Consequently, maintaining the abundant natural resources found on the Tongass is a major concern of those who make their living here.

In addition to economic activity, the quality of people's lives is greatly enhanced by the physical and biological environment associated with the Tongass. To many, Southeast Alaska is viewed as what America was like two hundred years ago. Alaska has always been known as a wild and magnificent place, a vast expanse of seemingly limitless scenery and abundant natural resources. People who live here and people who have never even seen Alaska think of it as "The Last Frontier." As a result, many Southeast Alaskans want to maintain the natural condition of the local environment, and at the same time, continue to maintain their economic livelihood. With a limited resource base, resolution of this conflict is becoming increasingly difficult.

Area of Influence

The primary area of influence for the Ushk Bay Project, with respect to the social and economic environment, includes most of Southeast Alaska. The livelihoods of most residents of this area are in one way or another connected with the Tongass National Forest, through jobs, subsistence and/or recreation. The specific areas within Southeast Alaska most likely to experience economic and social effects from the Ushk Bay Project are: (1) communities in close proximity to the Project Area, (2) nearby communities whose residents currently visit the Project Area to hunt, fish, or pursue other subsistence or recreational activities, and (3) nearby communities with production facilities that would use timber from the Project Area.

The largest community near the Project Area is Sitka, which is located approximately 30 miles to the south. Hoonah, Angoon, Tenakee Springs, and several other smaller communities are also within a 50 mile radius from the center of the Project Area. Residents of these communities may visit this area for hunting, fishing, subsistence, or recreational purposes. The four communities with production facilities that would likely utilize the timber from this area are Sitka, Wrangell, Ketchikan, and Klawock. Ketchikan and Sitka have pulp mills, although Sitka's pulp mill is currently shutdown. Wrangell and Klawock have sawmills, with the Klawock saw mill currently scheduled for reopening in 1995. Furthermore, there are a number of small sawmills scattered throughout the area.

Historical Perspectives

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 food, shelter, and livelihood to its inhabitants for thousands of years. The first 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 1700's, 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 1800's 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 1920's and 1930's, the Depression brought a decline in fish prices and mining employment.

The 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 1900's. In the earlier part of the century, small timber mills were operated in a few communities, but it was not until the mid twentieth century, that the timber industry became a major social and economic factor in Southeast Alaska, with the development of two large-scale pulp mills in Ketchikan and Sitka.

In the 1950's Alaska focused its attention on statehood. On January 3, 1959, President Eisenhower signed the proclamation establishing Alaska as our 49th state. The resultant economic shift towards more government employment and an expanding timber industry had implications beyond changes in 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.

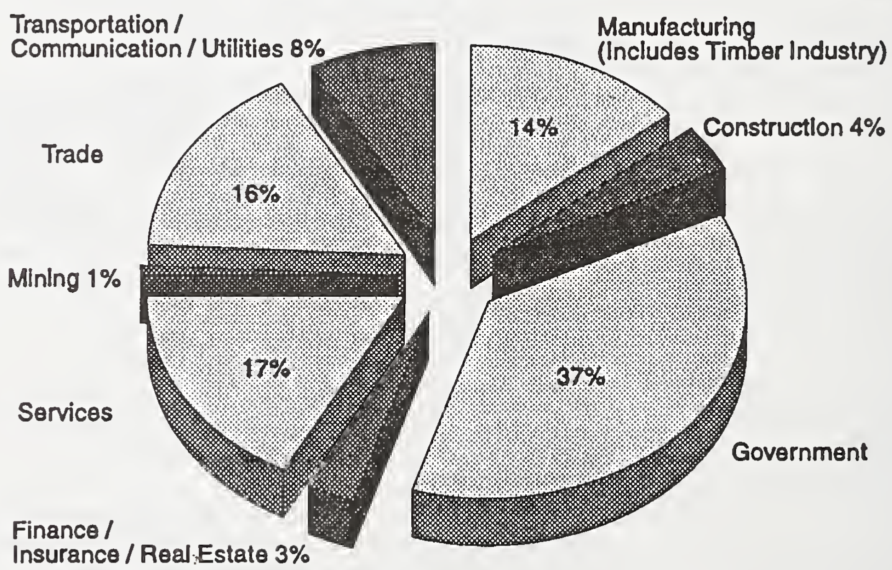
Today, most of the population of Southeast Alaska is concentrated in several urban communities, the largest of which are Juneau, Ketchikan, Sitka and Petersburg. The same industries which dominated Southeast Alaska's history: fishing, mining, and timber production, are still prominent industries in most of the urban communities. In addition, tourism, which has increased in its economic importance over the past several years, provides a major source of income to the economies of all communities. Government, transportation, and education are also significant sources of income. There are also numerous small, rural communities which depend primarily on fishing, timber production, and subsistence for their livelihoods.

Economy of Southeast Alaska

Southeast Alaska supports almost 15 percent of the state's occupational employment. Much of this employment is highly seasonal, and actual numbers of jobs may vary by as much as 10 to 15 percent over or under the annual average during the course of one year. Government occupies the largest share of the economy with 37 percent of the region's employment. Services, trade, and manufacturing also occupy fairly large sectors of the local economy. Figure 3-5 illustrates the breakdown of employment in Southeast Alaska by industry sector. In 1991, average employment in Southeast Alaska was 33,700 jobs. This figure was down slightly from the previous year. Over the past 10 years, however, regional employment figures have shown a steady increase in the number of jobs available. Through the next 5 years, employment levels are expected to rise. However, regional economic growth is projected to be slower than it has been in the past. This decreasing trend would occur mainly due to expected declines in timber cutting and wood processing employment, and expected slow growth in government employment (Alaska Department of Labor 1992b).

The private sector in Southeast Alaska is dominated by three industries, the timber industry, seafood industry, and recreation and tourism industry. Employment in the timber and seafood industries appear in Figure 3-5 under the manufacturing sector, while employment in the recreation and tourism industries is spread through the trade, services, and transportation sectors (Stinson, pers. comm. 1992). Much of the employment in these three industries is attributable to the large number of resources available in the Tongass National Forest. It is therefore likely that these industries would be more greatly influenced by the proposed actions in the Ushk Bay Project Area, than any other employment source in the region. Impacts on the timber industry would be especially significant, as the project affects this industry directly, with lesser impacts potentially occurring on the seafood, and recreation and tourism industries.

Figure 3-5
Industry Employment in Southeast Alaska, 1991



Source: Alaska Department of Labor, Research & Analysis, 1992a.

Each of these industries interacts with other sectors of the economy. So an action that affects one industry, will result in affects on other sectors of the economy as well. In addition, each of the three industries includes a number of sub-components. The timber industry directly impacts several economic sectors including heavy construction, lumber and paper products, and water transportation. The seafood industry includes the harvesting, processing, manufacturing, support, and transportation of fish or related products. The recreation and tourism industry directly impacts several economic sectors including the retail trade, service, and transportation sectors. The industry includes guides and outfitters, tours and transportation services, and sport hunting and fishing support services.

Seafood Industry

The waters of Southeast Alaska support a substantial seafood industry. This industry includes harvesting, processing, and aquaculture and provides a broad base of employment opportunities throughout Southeast Alaska. Many small towns and villages are very economically dependent on fish harvest and processing. Even in Sitka, the seafood industry accounts for approximately 28% of the basic industry employment, and 14% of the total employment.

Although employment in this industry is highly seasonal, and average annual employment varies from year to year, the seafood industry remains a major element in the Southeast Alaska economy. Major species harvested include five species of Pacific salmon (pink, sockeye, coho, chum, and chinook), herring, halibut, and other bottomfish species. Salmon harvests dominate the industry, both in volume and value of catch, and in harvest-related employment levels. The Tongass National Forest supports up to 80 percent of the salmon stream habitat in Southeast Alaska (Thomas 1990).

Fish harvesting in Alaska is highly regulated. This regulation is mainly intended to ensure that fish populations will continue being viable into the future. Fish permit systems and limited openings or seasons regulate the number of harvesters accessing the various fisheries. In the past, this regulation has kept employment levels in Southeast Alaska's commercial fishing industry relatively stable. This trend is expected to continue through the current decade, with no major fluctuations in employment levels. Table 3-27 shows employment levels and personal earnings for Southeast Alaska's seafood industry.

Table 3-27.

Southeast Alaska Fisheries Employment and Personal Earnings, 1980-1989

Year	Employment	Personal Earnings (in millions)
1980	3,475	56.4
1981	3,142	66.4
1982	3,332	69.8
1983	3,078	63.2
1984	3,277	71.6
1985	3,450	69.0
1986	3,500	87.5
1987	3,600	69.4
1988	3,500	85.5
1989	3,700	90.0

Source: Assam, 1992

Recreation and Tourism Industry

The Ushk Bay Project Area and rest of the Tongass National Forest lie within a highly picturesque region of Southeast Alaska. Over the last decade, recreation and tourism have become an increasingly important industry to the economy of the region. This trend is clearly seen in the increased numbers of visitors traveling to Southeast Alaska on cruise ships. Between 1981 and 1992, the number of cruise ship passengers traveling to Southeast Alaska increased by over 215 percent. Many cruise ship lines now offer tours through the region via the Inside Passage, making regular stops at ports along the way including Sitka. Newer and larger capacity ships, as well as smaller ships tapping special interests are ushering a new era of tourism to Southeast ports. The cruise ship season currently runs from May through September.

The numbers of tourists visiting the region by airplane and marine ferry have also increased within the last 10 years. Marketing studies by the Alaska Division of Tourism indicate that "scenery, forest, mountains, out-of-doors" and "wilderness, unspoiled, rugged" were the top interests appealing to potential visitors (Bright 1985). Increased sales of resident fishing and hunting licenses indicate that local resident recreation has also increased. Table 3-28 shows recreation and tourism indicators for Southeast Alaska.

Table 3-28.

Southeast Alaska Recreation and Tourism Indicators, 1975 - 1989

Year	Southeast Cruiseship Passenger Numbers[1]	Southeast Ferry System Use[2]	Juneau Airline Departures[3]	Scenic Flight Passengers Misty Fjords[4]
1975	46,279	230,000	110,660	NA
1980	86,815	276,000	155,699	3,000
1981	83,566	282,000	156,257	6,300
1982	87,358	300,000	150,871	5,200
1983	99,706	308,000	167,302	5,300
1984	118,781	311,000	168,685	7,000
1985	137,005	313,000	163,837	12,000
1986	164,400	296,070	156,667	11,900
1987	202,000	326,644	157,952	12,200
1988	198,870	344,209	167,314	8,500
1989	193,983	343,100	176,429	8,100
1990	237,070	363,122	185,310	No Data
1991	248,428	368,780	190,244	No Data
1992	264,855	327,680	No Data	No Data

Source: USDA Forest Service, Tongass National Forest, R10-MB-149, August 1991. Tongass Land Management Plan Revision, Supplement to the Draft Environmental Impact Statement. Data for 1990, 1991 and 1992 from Alaska Marine Highway Program - Traffic Division, Alaska Department of Transportation and Public Facilities, Juneau, Alaska; Southeast Alaska Tourism Council, Juneau, Alaska; Juneau Airport Manager's Office, Juneau Alaska; Misty Fjords National Monument, USDA Forest Service, Alaska Region.

1 From US Customs Data as collected by McDowell Group, Juneau, Alaska.

2 From Doug Burton, Alaska Marine Highway Program - Traffic Division (465-3946), Annual Traffic Reports - "Traffic Volumes by Port" Represents Boarding Passenger numbers.

3 From Juneau Airport Manager's Office (789-7821). Represents departing passenger numbers. Only a fraction are tourists. Included as an indication of visitation - business or pleasure - to Southeast Alaska.

4 From Misty Fjords National Monument (225-2148).

Unlike other industries, the tourism and recreation "industry" is not a single industry, but a composite of many that serve more than tourists. For example, retail trade, service, and transportation serve tourists as well as local industries and residents. The labor force and employment associated with tourism and recreation are different than manufacturing. The jobs tend to be highly seasonal and low paying.

It is estimated that nearly 3,900 jobs in the 1980s were supported by the recreation and tourism industry in Southeast Alaska (Thomas 1990). This number is expected to rise in the early 1990s as the demand for recreation and tourist opportunities increases. It is anticipated that this increased demand will be helped by the current weak US dollar, which will make foreign destinations more expensive and local destinations, such as Alaska, more attractive.

Timber Industry

From the earliest times timber has been important to the residents of Southeast Alaska. Before white settlers came, Southeast Alaska was inhabited by Tlingit and Haida Indians. These Indians developed an advanced culture based on products from the sea and forest. They hewed canoes up to 60 feet long from western redcedar and smaller ones from Sitka spruce or black cottonwood. Houses were log frames covered with hand-split cedar or spruce planks. Cedar totem poles in front of the houses kept alive the memory of important historical events or legends. Trees furnished most of the household, personal, and ceremonial articles used by the residents. Firewood was always in demand for cooking, warming, and drying or smoking fish and meat (Harris and Farr 1974).

The first demand for timber by white settlers came with Russian colonization. Logs were required for the construction of a fort, dwellings, and boats, as well as for a continuing supply of firewood. At Sitka, the Russians built a foundry, which required stands of hemlock and spruce to be clearcut and charcoal to be produced. As the Sitka colony prospered, new construction required a continuing supply of logs and lumber, as well as a constant supply of firewood and charcoal. Shipbuilding was an important occupation with Alaska-cedar favored for hull construction because of its durability. Selective logging for cedar took place along tidewater as far distant as Peril Straits, 60 miles away. This demand for Alaska-cedar was reported to have resulted in the exhaustion of the accessible supply of cedar near Sitka (Harris and Farr 1974).

The first Alaskan sawmill is thought to have been built at Redoubt Bay south of Sitka in 1833. Sometime before 1853, a second sawmill was built at Sawmill Creek about 5 miles south of Sitka, and a third at Sitka. About 3,000 board feet of lumber was produced daily by the Russian mills. Lumber was sawn for local use as well as for export (Harris and Farr 1974).

By 1889, after the Russian holdings in Alaska were sold to the United States, 11 sawmills were operating in Southeast Alaska, cutting timber for local use. Local demand for lumber needed in the fishing and mining industries increased with a reported annual cut of 8.45 million board feet in 1900. The Tongass National Forest was established in 1907 and was later expanded to include most of Southeast Alaska. Forest officers were brought in, and timber sales were made comparatively easy. As a result, the decade from 1910 to 1920 had approximately 4,000 timber sales totaling 420 million board feet of sawtimber and piling from National Forest lands (Harris and Farr 1974).

During the 1920's, the Forest Service proposed long-term sales, with 50 year contracts, to help establish a pulp industry in Southeast Alaska. The objective was to provide a sound economic base in Southeast Alaska through the establishment of a permanent year-round pulp industry. In addition, it was believed that the spruce lumber industry could not be expanded until extensive pulpwood logging operations were started and the many large, isolated spruce trees growing with the smaller pulp timber became economically accessible. The forests of Southeast Alaska were described as being primarily suited for pulpwood production, but with a large potential for sawtimber production as well (Harris and Farr 1974).

It was recognized that a heavy investment was required to build a pulpmill, and that at least a

50-year supply of timber should be made available for its use at the start of operation to justify the heavy expenditures involved. Interest developed on the part of the pulp industry, but the market collapse of 1929 and the depression that followed resulted in very little activity (Harris and Farr 1974).

The first successful long-term sale was made in 1951, and the construction of a pulpmill was completed at Ward Cove near Ketchikan in 1954. This contract with the Ketchikan Pulp Company is still in effect and supplies both the pulpmill and a sawmill. During the 1950's, the Forest Service offered three additional long-term sales; none of which are still in effect. The US Plywood-Champion Paper contract for the Juneau area was cancelled by mutual consent in 1976; no operations had taken place on the ground. The Pacific Northern Timber Company contract for the Wrangell area resulted in the construction of a sawmill and was shortened to 25 years. All activities for this contract were completed in 1981. The Alaska Pulp Corporation (APC) suspended operation of its Sitka pulpmill on September 30, 1993. The Forest Service responded on April 14, 1994, by cancelling the contract with APC.

Today, the timber resource is still vital to Southeast Alaska's economy. Forest products from the Tongass National Forest will continue to be utilized locally as well as marketed throughout the world. Out of all the various economic activities that occur in Southeast Alaska, the proposed actions in the Ushk Bay Project Area would likely exert the greatest influence on the region's timber industry. The Southeast Alaska timber and wood products industry is composed of multiple logging operations on both public and private lands. Cut logs may be processed in one of three major sawmills, two pulp mills, or numerous small sawmills scattered throughout the region. Products manufactured include dissolving pulp, dimension lumber, cants and flitches (rough sawn lumber meeting primary manufacturing requirements), wood chips, and raw logs.

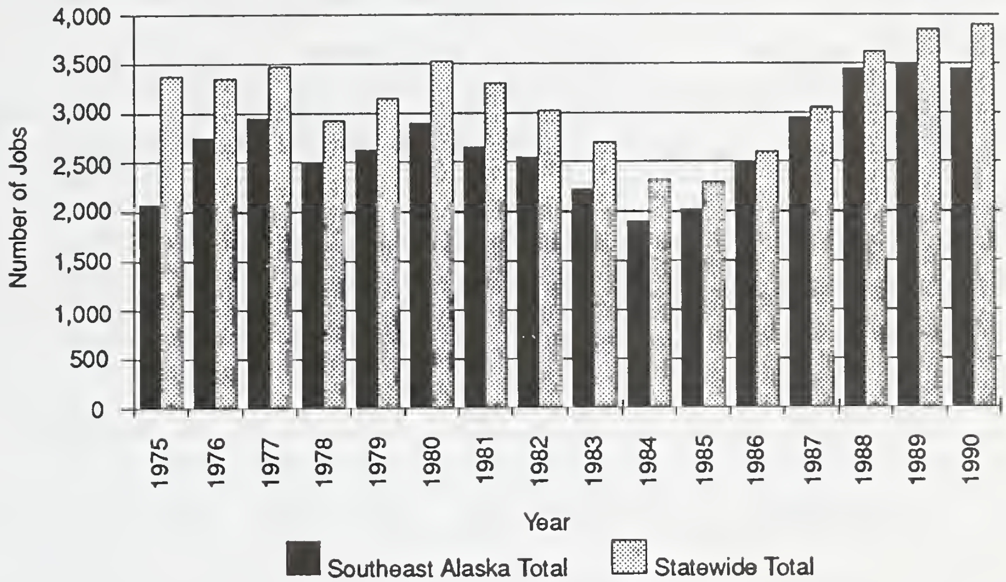
Timber Supply and Demand

In Southeast Alaska, the main sources of timber are the Tongass National Forest, and Native Corporation lands. By regulation, timber harvested on federal land undergoes primary manufacture into products such as pulp, lumber, or chips. There are exceptions to this rule. For example, Alaska-cedar was determined to be in excess of domestic needs and may be exported, under permit, as unprocessed logs. Western redcedar logs may be exported,under permit, until such time as a competitive market exists. Timber harvest from private lands may be exported as unprocessed logs.

Timber supply from the Tongass National Forest in fiscal year 1992 was 489 MMBF (net sawlog plus utility). Of this, 40 MMBF of timber was offered in short-term sales and 449 MMBF was fully prepared for release under the long-term contracts. The volume prepared for the long-term contract for fiscal year 1992 was higher than the 323 MMBF average for the previous four years. This increase relected a concentrated effort to ensure an adequate supply of timber in the years ahead. The volume of timber actually harvested varied only slightly from average for the previous four years. In addition to the timber supplied by the Tongass National Forest, an estimated 446 MMBF of timber was harvested from private lands (primarily Native Corporation lands) during the same year. The bulk of this material was exported and the volume offered to local processors is unknown (USDA Forest Service 1993, Section 706(a) Report).

In the late 1970s and early 1980s employment levels in Southeast Alaska's timber industry fluctuated from year to year, with a low of 1,900 jobs occurring in 1984. Between 1985 and 1990, however, increasing demand on the world market for forest products created a surge in employment levels in the timber industry. Industry employment increased by more than 80 percent. This increase is illustrated in Figure 3-6, which also shows the statewide levels of timber industry employment over the same period. This increased demand also allowed harvest and production levels to nearly double from levels seen in the early 1980s. From 1985 to 1989, the value of production also more than tripled. Data on timber export volumes and values are shown in Table 3-29.

Figure 3-6
Alaska Timber Employment, 1975 - 1990



Source: Alaska Department of Labor, Research & Analysis, 1991.

Fluctuating levels of employment and product values indicate that the Southeast Alaska timber industry is a volatile entity. As quickly and as easily as the market moves upward, it could slide back down. However, this volatility is often not caused by activities in the region. The forces which raised the markets in the late 1980s were beyond the control of any of the players in Southeast Alaska. Southeast Alaska timber companies did little to cause the increased demand, and will have little ability to influence the market if and when this demand begins to decline (Alaska Department of Labor 1991).

Foreign and domestic competition, currency fluctuations, tariffs, and import restrictions associated with international trade, are some of the factors that influence demand for Southeast Alaska timber projects. In addition, demand for Alaska forest products varies according to the product in question. Some products are unique in the world market, while others are quite common. One example of a unique product is the old growth, fine-grained Sitka spruce and hemlock logs. These are highly prized in Pacific Rim markets and have little direct competition from other areas outside of the Pacific Northwest. Consequently, this product commands a premium price. At the other end of the spectrum are softwood chips, used in pulp and pressboard products. Wood chips from Southeast Alaska have few advantages over their counterparts from other parts of the world. In order to be competitive, the offering price of Southeast Alaska wood chips has to be very close to the price of wood chips from other producing countries. Falling somewhere in between these two price extremes is the dissolving pulp produced by the region's two pulp mills. In the past, while there have been other pulp mills in the world producing dissolving pulp, there were sufficiently few to keep the price of this commodity fairly high.

The interaction of several factors will decide the future health of Southeast Alaska's timber industry. The supply of raw materials and the market for finished products, especially the international market, are the critical factors which will affect the future of the industry. Decisions made by the courts on several recent lawsuits, and Forest Service decisions on the

Table 3-29.
International Exports of Alaska Forest Products, Fiscal Years 1981 - 1990

Product/Units[1]	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Softwood Logs										
Volume (MMBF)	130.1	197.5	296.6	237.6	258.6	340.3	436.1	482.2	629.6	606.6
Unit Value ($/MBF)	526	483	439	408	385	405	412	543	493	578
Value ($ millions)	68.4	95.4	128.3	97.1	99.6	137.9	179.6	261.6	310.3	350.9
Lumber & Cants										
Volume (MMBF)	202.5	178.6	136.0	113.3	122.0	93.5	121.0	152.5	182.3	225.5
Unit Value ($/MBF)	298	350	334	284	266	264	280	342	389	378
Value ($ millions)	60.3	62.5	45.5	32.2	32.5	24.7	33.9	52.1	71.0	85.3
Wood Chips										
Volume (Mton)	60.5	84.8	19.0	10.5	4.5	0.0	0.0	10.4	77.9	18.2
Unit Value ($/ton)	90	75	66	32	98	0	0	54	46	78
Value ($ millions)	5.5	6.4	1.3	0.3	0.4	0.0	0.0	0.6	3.6	1.4
Wood Pulp										
Volume (Mton)	252.9	211.0	188.5	249.2	166.5	203.8	232.0	260.4	296.9	252.7
Unit Value ($/ton)	537	601	503	510	433	419	492	616	767	728
Value ($ millions)	135.7	113.3	94.8	127.3	72.0	85.4	113.9	160.4	227.7	185.4
TOTAL VALUE ($ millions)	269.9	277.6	269.9	256.9	204.5	248.0	327.4	474.7	612.7	622.9

Source: Alaska Department of Labor, 1991

1 Volumes reported in millions of board feet (MMBF) or thousands of metric tons (Mton). Values are free along ship (FAS) in millions of nominal dollars. Unit values are dollars per thousand board feet ($/MBF) or dollars per metric ton ($/ton). Dollar values are not adjusted to 1991 dollar values (i.e., dollars represent values for respective years).

meanings and ramifications of recent regulatory changes, will also affect the future of Southeast Alaska's timber industry.

Mill Capacity

The timber offered under the independent sale program on the Tongass National Forest is purchased for use by a wide variety of processors. Most of these buyers can be grouped into one of three market segments, each of which requires special consideration as to the amount and quality of the timber made available.

The first market segment includes the Wrangell Sawmill owned and operated by Alaska Pulp Corporation., the Klawock Sawmill owned by Viking Lumber Inc., and the three mills owned by the Ketchikan Pulp Company. The Wrangell Sawmill, despite record lumber prices, has operated at approximately 65 MMBF per year (60 percent of capacity) for the last five years.

The Klawock Sawmill, after an extended shutdown, was purchased recently and is scheduled to reopen in 1995 with full capacity set at 70 MMBF per year. Plans also include the construction of an on-site chipping facility. Although the Ketchikan Pulp Company (KPC) is the sole remaining holder of a long-term (50 year) contract on the Tongass National Forest, there is nothing to prevent it from bidding on, or purchasing additional volume under the independent sale program, or from buying chips for pulping from successful bidders. KPC operates a pulp mill and a sawmill in Ketchikan and the Annette Island Hemlock Sawmill in Metlakatla.

The second market segment includes four relatively new sawmills of moderate size. These sawmills have a combined capacity of approximately 40 MMBF. Finally, there are at least 10 and as many as 30 other buyers who use very small amounts of wood in the manufacture of musical instruments, cedar shakes and shingles, and lumber using small, portable mills. The total capacity of these operations is estimated at 7 MMBF.

Finally, it is important to recognize that mill consumption and capacity reflects the sawlog use and capacity of the mill; therefore the pulp component of the timber supply is not included in these figures. Mill consumption and capacity figures were adjusted upward accordingly to correlate timber consumption with timber sale volume. Data collected for timber appraisals indicate that on average, 50 percent of the total timber harvest is sawn, with the remainder used in pulp manufacture. Using this sawn ratio, a total annual sale volume of from 274 MMBF to 374 MMBF would provide a supply of sawlogs meeting the range of timber consumption rates. Operation of the Wrangell and Klawock mills alone can be expected to require some 180 MMBF of timber sale volume within the next 12 months.

Social Environment of Southeast Alaska

Population

Presently, only about 69,000 people live in the towns, communities and villages of Alaska's southeastern panhandle, most which are located on islands or along the narrow coastal strip. As of January 1990, only four of Southeast Alaska's twenty-two cities were considered urban (2,500 or greater in population) by U.S. Census Bureau definition. However, three of these cities, Juneau (26,751), Ketchikan (8,263), and Sitka (8,588) rank within the top five urban areas in the State; only Anchorage and Fairbanks are larger.

Southeast Alaska contains twelve percent of Alaska's population and six percent of its land area. Unlike the rest of the United States which is entirely organized into counties, Alaska remains largely unorganized. Within Southeast Alaska there are four buroughs which are equivalent to county governments in the rest of the United States. These include Juneau and Sitka, which are city/buroughs, 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. These include: 1) Skagway/Yakutat/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.

Most communities in Southeast Alaska are small, isolated from each other, and accessible only by air or water. Currently only four communities in this region of the state are accessible by land: Skagway, Haines, and Klukwan in the north, and Hyder in the south. The largest community in Southeast Alaska is Juneau, the state capital. Juneau accounts for almost 40 percent of the entire population of Southeast Alaska. Together Juneau, Sitka, and Ketchikan contain over 63 percent of the population in the entire southeast region of the state. The remaining population resides in more than 45 small communities scattered throughout the region. Many of these small communities have populations of less than 1,000 residents. Between 1960 and 1990, Southeast Alaska population grew from 35,403 to 68,989, an increase of 95 percent. The region's average annual growth rate over this 30 year period was 2.1 percent, with a corresponding 2.5 percent growth rate for the 1980s. In 1960 the population of Southeast Alaska accounted for 16 percent of the state population, while in 1990 this figure had dropped to 12 percent. The projected average annual growth rate for Southeast Alaska for the 1990s is approximately 1.7 percent. This growth rate would increase the population of this region to 81,756 by the year 2000.

Personal Income

In Alaska, 14 percent of the population earn below poverty level incomes, whereas the national average is approximately 12 percent. Southeast Alaska, however, shows a different trend. Here only 9.3 percent of the population earn below the poverty level. Southeast Alaska also has a higher per capita income level than the state as a whole. The 1990 per capita income for Southeast Alaska was $24,562, while the statewide average was $21,646, and the national average was $18,691. Although Southeast Alaska has a fairly healthy economy, the incomes and poverty levels are not equitable throughout all the communities in the region. The larger communities of Juneau, Sitka, Ketchikan, Wrangell, and Petersburg have estimated per capita income levels well above the statewide average of $21,646, with only a small percentage of their residents earning below poverty levels. The 1990 per capita income levels in these cities averaged approximately $25,071 (Leask, pers. comm. 1992).

This is not the case in most of the small rural communities scattered throughout the southeast region. Mainly due to the isolation of these communities, the cost of goods and services is often quite high, and high percentages of residents frequently earn at, or below the poverty level (Thomas 1990). The 1990 per capita income levels for these smaller Southeast Alaska communities averaged approximately $12,500 (Lask, pers. comm. 1992). Many of the people living in these communities, however, depend on hunting, fishing, gathering, and other forms of subsistence use of the land and water for their livelihood. Many of their basicneeds may be met by subsistence activities without the need for actual financial transactions, hence the need for money may be less (Thomas 1990).

Lifestyles

Southeast Alaska residents have a highly diverse set of life-styles, values, and economic pursuits. Many people choose to live in Southeast Alaska because of the opportunity to participate in the commercial fishing, timber, mining, and recreation industries. Other residents desire the lifestyle afforded by remote, uncrowded living situations, and the opportunity to be close to their families and friendship networks. Still other people choose to remain in Southeast Alaska because of the hunting, fishing, recreation and subsistence opportunities, and the chance to live in close proximity to a wilderness environment. Native American residents often remain attached to Southeast Alaska because it provides an important link in the practice of traditional customs, and in the preservation of their cultural heritage. Many Southeast Alaska residents want to keep that which makes their part of the world unique. At the same time, however, they also want to maintain their economic livelihood (Thomas 1990). With a limited resource base, resolution of this conflict in recent years has become increasingly difficult. The great diversity of attitudes, values, and life-style suggest that the proposed Ushk Bay project will likely affect people in both positive and negative ways.

Community Characteristics

Human settlements in Southeast Alaska range in size from one person living in a sheltered cove, to more than 26,000 people living in a full-service city. Although some communities are on Forest Service access road networks, most settlements are accessed primarily, if not exclusively, by air or by water. This relative degree of remoteness, combined with the considerable scenic and recreation opportunities provided by the Tongass National Forest, is sought by many wanting a more self-reliant lifestyle. Life in many remote communities of Southeast Alaska has its disadvantages. However, many residents of the area are also quick to point out that these disadvantages are far outweighed by the high quality of life found in Southeast Alaska (Thomas 1990).

Communities in Southeast Alaska exhibit varying degrees of economic development and diversity. Commercial fishing and fish processing, timber harvesting and processing, recreation and tourism, mining, and government are the major economic sectors in which local community members find employment. Still, the relative importance of these activities in any particular community is characterized by considerable local variability. Some communities have little or no local economy in the conventional sense, and rely heavily on local subsistence uses of the land and water for their survival. In these cases, sources outside the community typically play a major role in supplying goods and services that cannot be obtained from local subsistence sources. Some communities depend heavily upon a single economic activity, which supports a viable local economy, while other communities have a full range of economic activities, which together enable their local economies to exhibit smaller swings in employment availability throughout the year.

Community Stability

Maintenance of community stability is a very important consideration in the planning of resource management activities, such as the Ushk Bay Project. The careful management of these resources is vital to the overall social and economic health of the region as a whole. A high percentage of residents of Southeast Alaska derive their livelihoods from jobs, or other activities, which could be traced back as being related in one way or another to the Tongass National Forest. Most of them also participate in a wide variety of personal activities which also depend upon the Forest. Therefore, resource management activities in the Tongass National Forest are

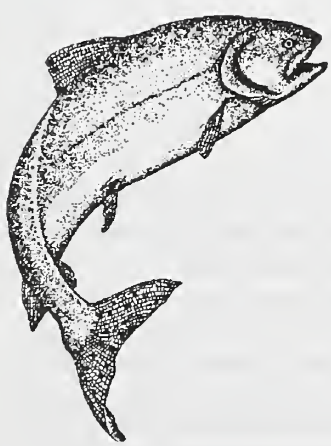


Table 3-30.

National Forest Receipts and Payments to the State of Alaska, Fiscal Years 1980 - 1990

Fiscal Year	Tongass Receipts[1]	Payments to Alaska
1980	26,024,494	6,506,124
1981	15,007,944	3,751,986
1982	21,622,764	5,405,691
1983	5,365,915	1,341,479
1984	4,063,189	1,015,797
1985	209,231	52,308
1986	1,967,240	491,810
1987[2]	-2,033,575	—
1988	1,232,672	308,168
1989	20,183,133	5,045,783
1990	35,544,272	8,886,068
TOTAL	129,187,278[3]	32,805,213

Source: USDA Forest Service, Tongass National Forest, R10-MB-149, August 1991. Tongass Land Management Plan Revision, Supplement to the Draft Environmental Impact Statement.

1 Capital Investments such as permanent roads, bridges, log transfer facilities, and timber stand improvements also contribute to the total assets of the Tongass National Forest, reduce future management costs, and are scheduled to achieve management objectives described in the Tongass Land Management Plan.

2 Tongass receipts for fiscal year 1987 were negative as a result of 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 $2,139,943. As a result of the negative receipt, no payments to the State were made in 1987.

3 Does not include receipts foregone as a result of the Federal Timber Contract Payment Modification Act. Estimated total value of affected contracts was approximately $54.5 million prior to the Act if all volume were harvested. Total value of the affected contracts as a result of the Act was approximately $1.2 million. The difference of $53.3 million represents receipts foregone, thus, the total Tongass receipts for the period fiscal years 1980-88 would have been $126.8 million.

of great importance to all communities in Southeast Alaska. Decisions made and actions taken in the Forest have the potential to impact community stability in every community in the region.

Timber Receipts and Payments

Annual payments are made to the State of Alaska from funds collected through the Tongass National Forest timber program. Table 3-30 itemizes these payments, and also indicates the annual receipts of the Tongass timber program. With few exceptions, 25 percent of all funds received by the program (including purchaser road credits) is paid to the State. The State in turn uses these funds to benefit public schools and public roads in the region. The total value of funds contributed in the past, however, has not comprised a significant portion of the total public school and public road budgets, for the cities and boroughs of Southeast Alaska (Thomas 1990).

Economic Efficiency of Timber Harvests

The National Forest Management Act of 1976 (NFMA) set forth explicit requirements for economic efficiency analysis of National Forest management proposals. While economic efficiency must be analyzed and considered, it is not the sole decision criterion. Although the Forest Service has generally tried to achieve cost-efficient management (lowest possible input cost per unit of output), systematic evaluation of all costs and benefits from practices and activities has been undertaken only in recent years.

The measure of economic efficiency applied in formulating and evaluating alternatives is Net Public Benefits (36 CFR 219.1(a) and 219.12 (f)). Net Public Benefits (NPB) are the sum of Present Net Value (PNV) and non-priced commodity values. PNV is the difference between the discounted value of all outputs to which monetary values or established prices are assigned, and the total discounted costs of managing the planning area. Examples of non-priced benefits include scenic quality, wildlife habitat, and community stability. Values of some non-priced commodities are inferred from observations of indicators such as the number of participants, tolerance of congestion, and expense of participation.

The dominant non-priced commodities for the Ushk Bay Project Area are embodied in the planning issues. The major components of PNV in the Project Area are timber, commercial fish, and recreation and tourism.

Land Ownership and Land Use

All Project Area land is within the Tongass National Forest and is located in three Value Comparison Units (VCUs), 279, 280 and 281. All land within the Forest was also given a and use designation (LUD) in the Tongass Land Management Plan, as amended (USDA Forest Service 1979, 1986). The purpose of the TLMP is to guide all natural resource management activities and establish management standards and guidelines for the Forest. Under the TLMP there are four different designations that indicate the land use allocated for particular areas of the Forest. For the Project Area, the only applicable LUDs are III and IV. A designation of III means that the lands will be managed for a variety of uses and activities in a manner providing the greatest combination of benefits. A designation of IV means opportunities will be provided for intensive resource use and development where emphasis is primarily on commodity or market resources. Timber harvesting is allowed under LUDs III and IV. VCU 279 is designated LUD III and VCUs 280 and 281 are designated LUD IV.

No easements, rights-of way or mining claims have been identified in the Project Area.

Private Lands and Native Allotments

The Alaska Native Allotment Act of 1906 allowed for individual Alaska Natives, who had occupied lands prior to its designation as National Forest, to apply to the Bureau of Land

Management for conveyance of up to 160 acres, under conditions prescribed by the Act and Federal regulations. There are two privately owned parcels of land within the Project Area, both resulting from Native Allotment claims. One is a 4.35-acre parcel on the north side of Poison Cove in VCU 279 that was conveyed to the heirs of Mr. Charles Benson in 1969.

The second is a 4.14 acre parcel of land at the head of Deep Bay in VCU 280 that was conveyed in 1979 to the heirs of Mr. Frank Kitka. Mr. Kitka's heirs have requested the remaining 155.86 acres.

Special Use Permits

There are five special use (outfitter/guide) permit holders in the Project Area. Outfitters and guides take clients into the Project Area by boat or float plane for hunting, sport fishing, crabbing, sightseeing, wildlife viewing and photography. Hunting and sightseeing use is predominantly at or near the beach.

Other Use Issues

A public use management plan for the Sitka area has been prepared as an amendment to the Sitka Coastal Management Program. It was drafted in consultation with the Coastal Management Citizens Committee made up of local residents. The plan received approval from the Alaska Coastal Policy Council on June 18, 1993.

The intent of the public use management plan is to identify the most outstanding, site-specific recreation and/or subsistence use areas within the Sitka Coastal District and to propose management guidelines for those areas to maintain existing uses and limit use conflicts. The objective of the citizens committee was to designate "Special Management Areas" and develop policies for their use. These policies and guidelines provide a vehicle for all management agencies to achieve cooperative land and water management solutions for these significant recreational and subsistence use areas within the Sitka Coastal District.

Ushk Bay has been identified by the committee for inclusion in the management areas of the Sitka Public Use Management Plan. The boundary is defined as "200 feet landward of Mean High Tide and 200 feet seaward of Mean Lower Low tide along the entire bay to land points approximately mid-bay, except for previously leased log storage areas." The Bay was chosen due to its concentrations of Dungeness and king crabs and its use by recreational boaters.

The log storage areas excluded from the boundary in the plan had been leased to the Alaska Pulp Corporation until the Alaska Department of Natural Resources permit expired. The old storage area was located in the Ushk Bay tidelands. The Alaska Pulp Corporation has received permits from the US Army Corps of Engineers and an interim DNR lease for a storage area which would not be in the tidelands. The corporation is currently using a log storage area leased in Poison Cove, and would store any extra logs in Ushk Bay. Poison Cove has not been proposed for protection in the management plan.

While Federal lands are specifically excluded from the Coastal Management Program (Coastal Zone Management Act of 1972, 15CFR 923.33), Federal agencies are directed by the program to carry out activities in a manner consistent with the Coastal Program to the greatest extent practicable. The recommendations of the Public Use Management Plan are advisory in nature and the district has no authority to regulate the management of Federal lands. It is noteworthy, however, that the policies in the plan give a clear indication as to the way the district's residents would like to see these designated special areas managed.

Subsistence

Subsistence use of natural resources on the Tongass National Forest is a mechanism through which many rural residents of Southeast Alaska maintain their physical, economic, cultural and social existence. Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA) requires the Federal Government to provide a subsistence priority to rural Alaskan residents on federal public lands. ANILCA defines subsistence 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 non-edible by-products 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, 16 USC 3113).

ANILCA provides for "the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives, on public lands." It also legislates 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".

The Federal Government manages subsistence use of fish and wildlife resources on federal lands through the Federal Subsistence Board. A priority for the taking of fish and wildlife from public lands for subsistence purposes is given to Alaska residents of rural areas or communities if a resource shortage occurs.

Subsistence activities include hunting, fishing, and trapping, as well as collecting berries, edible plants, and fuel wood. In addition to the harvest and consumption of resources, subsistence is also an important component of social life. Sharing with family and friends is embedded in local culture. Forty-one percent of all deer-harvesting households in Southeast Alaska give deer meat to friends and relatives (Kruse and Muth 1990). In addition, resources may be traded among communities unable to obtain specific subsistence resources locally. Thus, distribution of wild, renewable resources represents an essential part of the tradition and culture of Southeast Alaska (Langdon and Worl 1981).

Subsistence gathering also serves as an important economic base for rural residents of Southeast Alaska. Approximately one in three households gets at least half of the food consumed from harvesting resources. The diversity of resources harvested within communities varies, with one in five households harvesting more than ten different types of resources (Kruse and Muth 1990). Limited per capita income may increase dependence on subsistence harvesting. However, the Tongass Resource Use Cooperative Study (TRUCS) data indicated that a higher income may also increase subsistence harvesting, and that subsistence harvesting is unlikely to diminish if household incomes increase (Kruse and Muth 1990).

Historical Tlingit Clan Hunting Boundaries

Goldschmidt and Haas (1946) identified land use patterns associated with Native Communities in Southeast Alaska. Comparisons between maps produced by Goldschmidt and Haas (1946), with those in TRUCS and ADF&G technical papers indicate that subsistence hunting and gathering areas are somewhat similar to traditional hunting grounds. However, TRUCS and ADF&G harvest data indicate that hunters from distant locations have used the Project Area. Technical advances (i.e., motor boats and airplanes) have enabled hunters to travel beyond the boundaries established by their ancestors. In addition, travel for work takes some people in to other areas where they may hunt and fish.

The Project Area is the historical territory of Sitka Tlingits. Not surprisingly, Sitka residents use the Project Area more than any other community, with Sitka residents harvesting more deer in the Project Area than all other communities combined.

Figure 3-7
Areas Where Households Have Ever Fished for Salmon

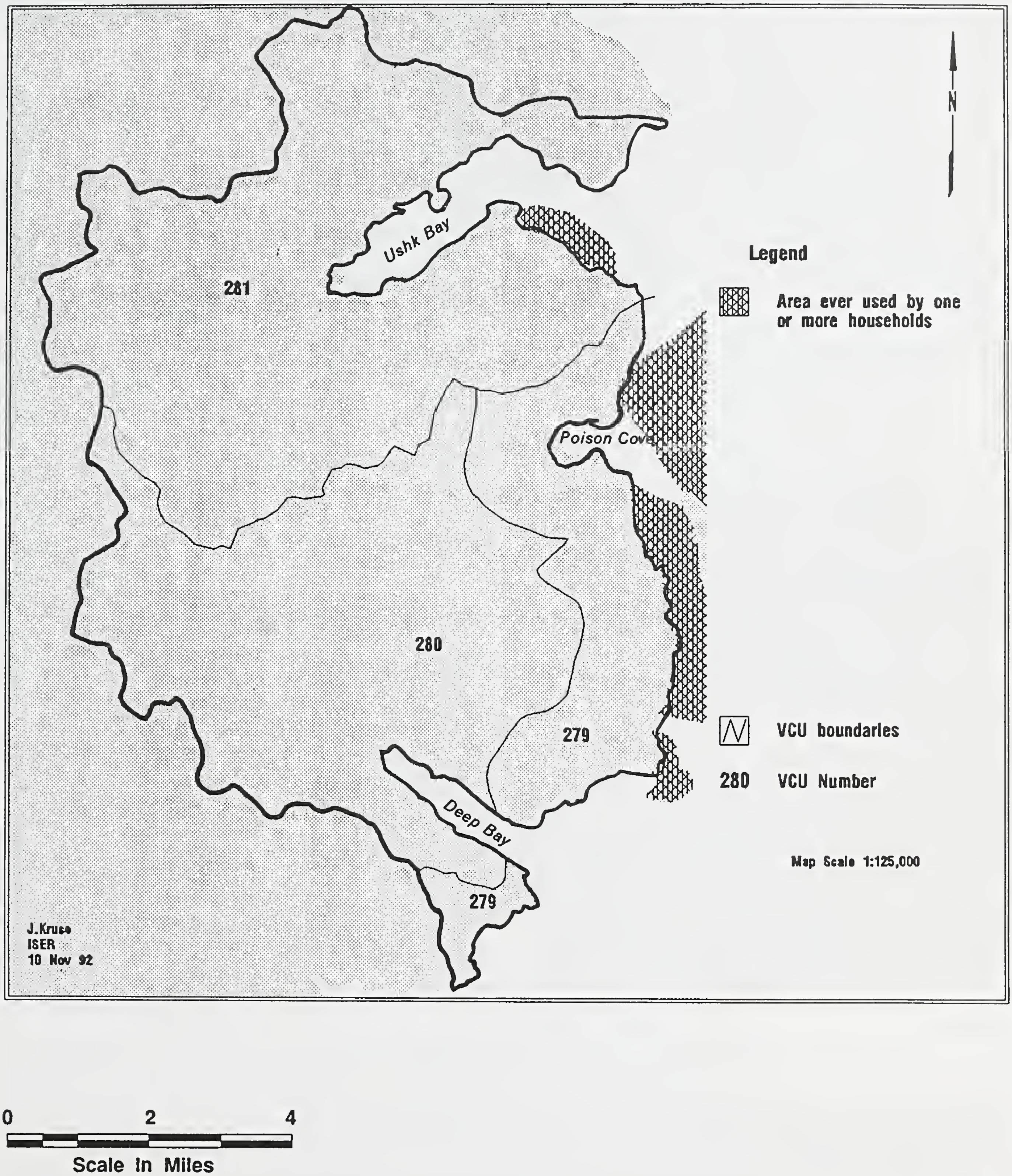


Figure 3-8

Areas Where Households Have Sought Marine Invertebrates

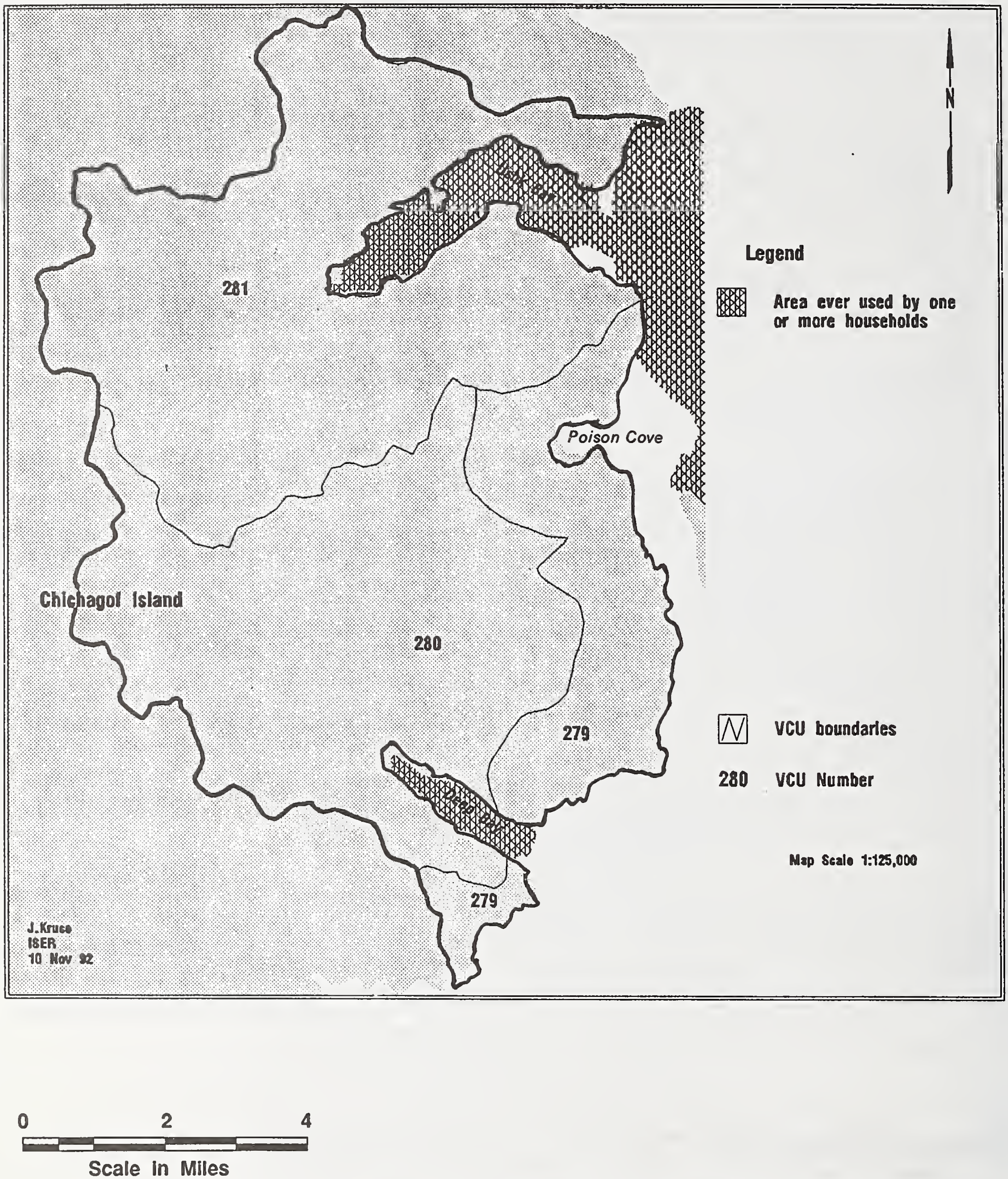


Figure 3-9
Areas Where Households Have Ever Hunted Deer

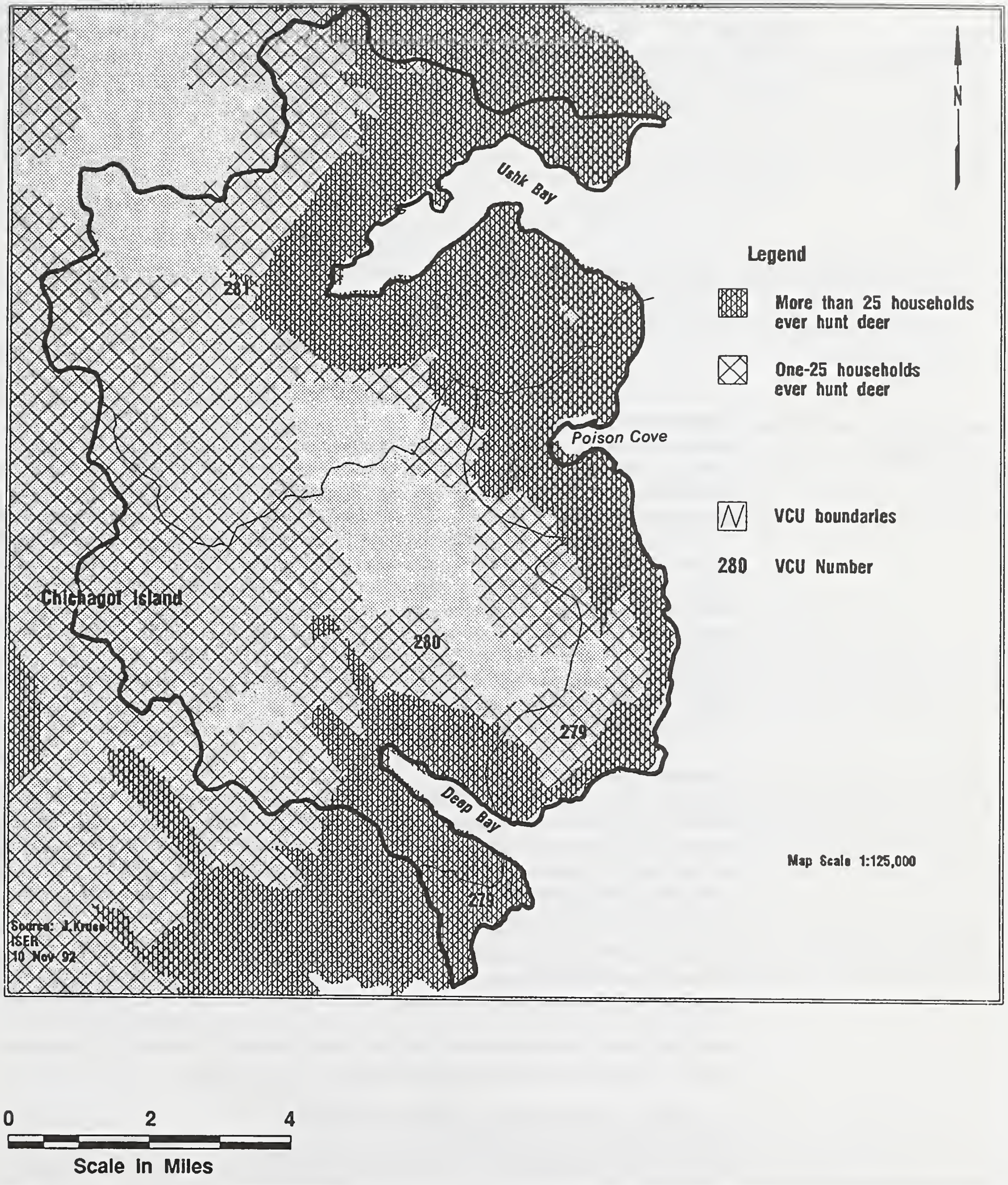


Table 3-31.
Community Demographic and Harvesting Information

Harvest Community	Population[1] 1988	Average[1] Per Capita Income	Per Capita[1] Total harvest (lbs)/1987	Percent[2] Household Meat Supply	Fish[1] Harvest (lbs)	Game[1] Harvest (lbs)
Haines[3]	1,638	$17,463	105[5]	21	74	29
Petersburg[3,4]	4,040	$19,743	203	31	121	64
Sitka[3,4]	8,041	$20,392	139	24	99	40
Wrangell[3,4]	2,836	$21,301	164	23	119	46

Source: Frostholm and Janis, 1992

1 Southeast Alaska Rural Community Resource Use Profiles 1989.

2 Kruse and Muth 1990.

3 TRUCS data (USDA Forest Service, Tongass Land Management Plan Revision, Appendix K, 1991).

4 ADF&G harvest data.

5 1988 data

Subsistence Use in the Project Area

Communities with Subsistence Uses

Subsistence is a complex issue that touches many aspects of the lifestyle of rural Alaskan residents. Subsistence communities that have harvested deer from the Ushk Bay Project Area during the five-year period, 1987-1991 include Kake, Pelican, Petersburg, Rowan Bay, Sitka, and Wrangell (ADF&G 1993). TRUCS data indicates that Angoon, Edna Bay, Haines, Hoonah, Port Protection, and Tenakee Springs have used the Project Area. Subsistence fishing has been reported by Sitka and Wrangell residents, and subsistence use of other wildlife species besides deer has been reported by Sitka and Angoon residents (Gmelch and Gmelch 1985). Communities considered most likely to harvest resources from the Project Area were identified from several sources including TRUCS data and ADF&G technical papers and harvest data. Communities were considered to be among the most likely users if they had more than 10 households reporting ever hunting in the Project Area WAA (USDA Forest Service 1991c) or reported harvesting deer in 1991 (the last year for which ADF&G Harvest Data is available). Communities that met those criteria are Haines, Petersburg, Sitka, and Wrangell.

Important Subsistence Use Areas

Subsistence harvesters travel to the Project Area by boat via Peril Strait. Although travel distances vary, the shortest travel distance to the Project Area is from Sitka, the community that utilizes the area the most. Rural residents use Ushk Bay, Poison Cove, and Deep Bay to harvest fish and shellfish. In addition, they use the beach and beach fringe for hunting. Inland hunting in the Project Area is limited by its steep slopes and absence of roads. Areas which are reported to have been used to hunt deer are shown in Appendix H, by community.

At a June 17, 1992 scoping meeting in Sitka, local residents stated that they considered Deep Bay to be a very productive area for both crab and salmon. Ushk Bay was noted as being a favorite location for seeking king crabs and as on anchorage for subsistence use. Deep Bay Creek produces more salmon than any other stream in the Project Area (see the Fish and Water Resources section for more information). The Kitka family, owners of a cabin and smokehouse at the head of Deep Bay, report generations of subsistence use at that site.

Geographic Extent of Regional Subsistence Use

The geographic spread of subsistence use in the Project Area for salmon, marine invertebrates, and deer, is shown in Figures 3-7, 3-8, and 3-9, respectively. Generated from TRUCS data, these maps show the intensity of use for all communities that have used the Project Area. As the maps indicate, the Project Area is most often used to hunt deer, with the beach fringe receiving the heaviest use.

The following must be considered while reviewing the TRUCS maps:

- Mapping of salmon, other finfish, marine invertebrates, and marine mammals was not requested of respondents in the following communities that had previously participated in ADF&G studies: Hoonah, Kake, Klawock, Angoon, Tenakee Springs, and Yakutat.
- The dissolved coverages for resources other than deer in Sitka are not reliable indications of use due to a low response rate during the mapping phase and due to the low number of respondents reporting use. Further research will be required to produce reliable resource use maps for Sitka.

Community-Specific Subsistence Use

Table 3-31 presents data pertaining to the subsistence communities considered the most likely to harvest resources in the Project Area. Based on household surveys in 30 rural communities, the TRUCS data shows which areas have been used by subsistence harvesters, but does not indicate harvest levels. ADF&G data includes total hunter kill data from 1988 to 1992, differentiated by rural (subsistence) and non-rural (non-subsistence) community. Both TRUCS and ADF&G data indicate that Sitka residents are the primary users.

The following descriptions give an overview of the four rural communities in Table 3-31. While other communities have also used the Project Area, their level of use was not sufficient enough to consider them likely to harvest in the Project Area. Also, non-rural communities (Juneau and Ketchikan) have used the Project Area, but each of these communities have obtained less than one percent of all the deer taken from the area. Those communities also obtained less than one percent of their deer from the Project Area.

Haines

Haines is located in northern Southeast Alaska, on the Chilkat Peninsula.

Haines residents harvest salmon, goats, moose, shellfish, eulachon, marine fish waterfowl, trout and bear. The annual harvest of these resources was 105 pounds per capita in 1988, with subsistence providing 21 percent of the household meat supply. Other finfish was the main subsistence item taken, comprising 36 percent of the total per capita harvest. However, salmon at 27 percent was also an important food item.

Chilkat Tlingits first occupied the area that is now the Chilkat Valley and Peninsula. These Natives now divide their population into two groups: the Chilkats of the Chilkat River drainage, with Klukwan being the major population center; and the Chilkoots living in the vicinity of Haines (ADF&G 1989). The Haines natives have shared a portion of their territory with the Klukwan natives and outsiders (Goldschmidt and Haas 1946). There is no evidence, however, to indicate that the Chilkoots have traditionally used the Project Area.

Portions of the Project Area have been used by Haines residents for subsistence deer hunting purposes. No deer were harvested from the Project Area by Haines residents from 1988-1992, although they reported having used slightly over 8 percent of the Project Area for subsistence purposes (USDA Forest Service 1991c; ADF&G 1992).

Petersburg

Petersburg is located on the northwest shore of Mitkof Island.

Petersburg residents harvest deer, bears, moose, salmon, other finfish, waterfowl, clams, crabs and berries. The annual harvest of these subsistence resources in 1987 was 203 pounds per capita, with subsistence providing 31 percent of the household meat supply. Salmon was the largest subsistence item harvested, comprising 23 percent of the total per-capita harvest. However, deer and other finfish (both at 22 percent) and shellfish (17 percent) were also important food items.

Traditional use of the area (now called Petersburg) occurred as Tlingit villages dispersed into small family groups during the spring, summer and fall. These small seasonal / temporary groups harvested and processed resources before returning to the larger village for the winter (Smythe 1988). The current Petersburg location was originally a Tlingit summer fishing camp (ADF&G 1989). These seasonal settlement patterns were modified under the influence of Russian, British and American traders. In 1900, Petersburg began to be settled and developed by homesteaders and fishermen. Some Natives fished for a local cannery (Smythe 1988).

Portions of the Project Area have been used by Petersburg residents for subsistence deer hunting purposes. Between 11 and 50 Petersburg households reported having used approximately 6 percent of the Project Area (USDA Forest Service 1991c). Petersburg residents harvested 11 deer from the Project Area between 1987 and 1991 (ADF&G 1992).

Sitka

Sitka is located on the west-central portion of Baranof Island.

Sitka residents harvest deer, bears, goats, seals, waterfowl, other birds, furbearers, salmon, shellfish, marine fish and berries. The annual harvest of subsistence resources was 139 pounds per capita in 1987, with subsistence providing about 24 percent of the household food. Deer and salmon were the largest resource items harvested, comprising 27 percent and 28 percent, respectively, of the total per capita harvest. Other finfish (25 percent) were also an important subsistence item harvested.

The territory for the Sitka Tlingits extends along the Pacific Coast of Chichagof and Baranof Islands from Point Urey in the north to Cape Ommaney, including all the islands off the coast. The territory also extends up Peril Strait between Chichagof and Baranof Islands into Hoonah Sound as far as Patterson Bay. The Project Area has traditionally been used by Sitka Tlingits. Although the Sitka territory is adjacent to the Angoon territory, by most accounts, Angoon residents considered the current Project Area to be Sitka Tlingits territory (Goldschmidt and Haas 1946).

As noted above, Sitka residents have used the Project Area more than any other community for subsistence purposes. Sitka residents harvest deer, salmon, halibut and crabs (USDA Forest Service 1991c; Gmelch and Gmelch 1985). The area is also used for trapping. The target species for trapping are marten, mink and land otter (Gmelch and Gmelch 1985). As presented in Table 3-32, Sitka residents harvest about 6 percent of their deer from the Project Area. In addition, Sitka residents have obtained subsistence permits to fish in Deep Bay and Ushk Bay (Schroeder 1989).

Wrangell

Wrangell is located on the northern tip of Wrangell Island.

Wrangell residents harvest deer, bears, moose, waterfowl, salmon, halibut, other finfish, other marine fish, shellfish and berries. The annual harvest of subsistence resources was 164 pounds per capita in 1987, with subsistence providing approximately 23 percent of the household meat supply. Shellfish and other finfish were the main subsistence items taken, with each comprising 26 percent of the total per capita harvest. However, salmon (18 percent) was also an important food item.

Wrangell was an important Tlingit site due to its proximity to the Stikine River, which was a trade route to the Interior. A major Tlingit village (Kotzlitzna) was located 13 miles from the present Wrangell location (ADF&G 1989). There is no evidence, however, to indicate that the Wrangell natives have traditionally used the Project Area.

Portions of the Project Area have been used by Wrangell residents for subsistence deer hunting purposes. Wrangell residents have used the Project Area to harvest deer, harbor seals, salmon and other finfish (Cohen 1989). Wrangell residents take less than one percent of their total deer harvest from the Project Area (see Table 3-32). Approximately 38 percent of the area is used by between 1-10 Wrangell households for deer hunting (USDA Forest Services 1991c).

Hunter Use of Wildlife Resources

The Project Area encompasses approximately 79 percent of WAA 3311, which lies within Game Management Unit 4. The harvest data indicates that the greatest subsistence use of WAA 3311 is for deer hunting, that few brown bears were harvested for subsistence purposes, and that marten and otter are harvested in WAA 3311, but not in great quantities. Between 1988 and 1992, all of the marten and otter harvest was by subsistence users from Sitka. Of the ten brown bears killed between 1988 and 1992, two were harvested by Sitka residents and the remainder by rural Alaskans.

Table 3-32.
Number of Deer Harvested by Community, WAA 3311 vs All WAAs

	Community			
Year	*Haines*	*Petersburg*	*Sitka*	*Wrangell*
1988				
WAA 3311	0	11	302	0
All WAA	461	1,180	4,738	361
% in WAA 3311	0	1	6	0
1989				
WAA 3311	0	0	277	0
All WAA	353	1,102	3,658	386
% in WAA 3311	0	0	8	0
1990				
WAA 3311	0	0	338	16
All WAA	351	1,534	4,151	327
% in WAA 3311	0	0	8	5
1991				
WAA 3311	0	0	41	0
All WAA	100	642	1,619	262
% in WAA 3311	0	0	3	0
1992				
WAA 3311	0	0	85	0
All WAA	137	916	2,483	426
% in WAA 3311	0	0	3	0
Total				
WAA 3311	0	11	1,043	16
All WAA	1,402	5,374	16,649	1,762
% in WAA 3311	0	<1	6	<1

Source: ADF&G 1993.

Table 3-32 displays the deer harvest by community from 1988 to 1992. During these five years, approximately six percent of the total deer harvested by Sitka residents came from WAA 3311. Wrangell and Petersburg residents obtained less than one percent of their total deer harvest from the Project Area. Haines residents harvested no deer from WAA 3311 between 1988 and 1992. Non-rural Alaska residents have also hunted deer in the Project Area, but the harvest has been approximately three percent of the deer taken in the Project Area.

Summary of Community Use

Sitka, Wrangell, Petersburg, and Haines were determined to be the most likely communities to harvest resources in the Project Area. Sitka residents harvested more than 90 percent of the deer taken from the Project Area between 1988 and 1992. Based on data from 1988 to 1992, Sitka obtains approximately 6 percent of its deer harvest in the area. Geographically, Sitka is the closest community to the Project Area, which residents can reach by skiff. Finally, the Sitka Tlingits regard the Project Area as their historical hunting grounds. By contrast, other communities are all farther away, and they obtain less than one percent of their total deer subsistence harvest in the Project Area. Collectively, the other communities took less than 10 percent of the deer harvested in the Project Area between 1987 and 1991. The pattern is similar for other subsistence resource use in the Project Area, with Sitka being the dominant user community.

Heritage Resources

Archaeological materials recorded within Southeast Alaska are described in the Tongass National Forest Cultural Resources Overview (Arndt et al. 1987) and define a cultural history spanning some 10,000 years of occupation by native prehistoric peoples. Early ethnographic efforts by the Russians during the early to mid-1800s, and by later ethnographers from the late 1800s up to the late 1900s, have described three broad groups of early historic native peoples that include the Tlingit, the Alaskan Haida (Kaigani), and the Tsetsuat. Of these, the Tlingit are the most widespread and numerous within the region. The Alaska Haida are relatively new to Southeast Alaska, migrating from the Queen Charlotte Islands early in the eighteenth Century, and displacing the Tlingit over a significant portion of the southern half of Prince of Wales Island. Similarly, the Tsetsuat, an Athabaskan group, were probably also recent arrivals, having entered coastal Alaska during the historic period from the interior. Quickly falling under the influence of local Tlingit groups, the Tsetsuat ceased to exist as a separate culture by late in the nineteenth Century. The Tlingit were distributed in a number of localized clan-based territorial groups across Southeast Alaska, with some 10 or more such groups being known.

Very limited ethnographic data is available which relates clearly and unequivocally to the Ushk Bay study area. It appears, however, that the study area is situated in the vicinity of a cultural boundary or joint use area involving two adjacent Tlingit territorial groups, the Sitka Tlingit and the Angoon Tlingit (Goldschmidt and Haas 1946).

The Sitka Tlingit held most of the Pacific Coast of Baranof and Chichagof Islands and the numerous smaller islands to their west. Sitka Tlingits interviewed by Goldschmidt and Haas reported that they occupied various locations along Peril Strait as far to the east as "...Poison Cove, Ushk Bay, Fick Cove, and Patterson Bay." While some of current native allotments in this area are claimed by individuals affiliated with the Sitka Tlingit, the Sitka Tlingit do not appear to have had any major villages here.

Testimony from Angoon Tlingit elders also supports this view. The Angoon Tlingit held the west coast of Admiralty Island and large portions of the eastern Baranof and Chichagof Islands. Angoon Tlingit informants claimed that their territory extended westward down Peril Strait to the vicinity of Poison Cove. They also say that, formerly, they traversed completely through the straits to the ocean in order to hunt sea otter at Kalinin Bay. As is the case with the Sitka, the Angoon Tlingit do not appear to have had any major villages in the immediate vicinity of the Ushk Bay study area (Goldschmidt and Haas 1946).

Cultural Resource Surveys

The structure and content of the archaeological research activities undertaken in the Ushk Bay Study Area were identified and specified by the Tongass National Forest. These activities represent elements of a long-term cultural resources management program being conducted by the Tongass National Forest in compliance with Section 106 of the National Historic Preservation Act. The research design for the Ushk Bay project relies on the data, discussion, and concepts identified in the Forest Service, "Draft Region 10 Research Design/Predictive Model Format" (Autrey 1992).

Archaeological efforts have, to date, recorded some 2,100 sites in Southeast Alaska. A large percentage of these are shell midden deposits, although numerous types of other prehistoric and historic resources also occur (Autrey 1992). At the same time, it must be noted that only a very small number of these have been investigated in any detail. The Tongass National Forest Cultural Resource Overview's reconstruction of the region's prehistory describes about 10,000 years of occupation which are considered to represent two relatively distinct cultural traditions (Arndt, Sackett and Ketz 1987). The break between these two appears to have occurred ca. 5,000 years ago; Arndt et al. refer to them simply as the Early and Late Prehistoric Periods. More recently, Davis (1990) has proposed a chronology which elaborates on the structure evident in the former. Davis sees an early tradition (the Paleomarine Tradition) beginning about 11,000 B.P. and a later tradition (the Developed Northwest Coast Stage) spanning the last 5,000 years. Further, he places a Transitional Stage between these two and divides the Developed Northwest Coast Stage into three phases. In character, the traditions of both Arndt et al. and Davis share many attributes.

Southeast Alaska has a rich heritage of Native Alaskan cultural resources.

Portions of the Ushk Bay Study Area have been subjected to at least reconnaissance level archaeological inspection on five occasions prior to the present study (Gilman and Iwamoto 1992). The earliest of these was Ackerman (1975); the most recent Swanson (1987). The principal focus of all such efforts has been the near-shore vicinities of Ushk Bay, Deep Bay, and Poison Cove. Previous surveys examined relatively little of the Peril Strait shoreline between these bays, or of the surrounding higher ground surfaces above 100 feet in elevation. These efforts, in total, identified two prehistoric midden archaeological sites, two small possible prehistoric sites, and one historic site. In response to public comment, both potential sites were further investigated in 1993. Neither was determined to represent an archaeological resource.

Table 3-33.
Cultural Sites and NRHP Eligibility by VCU

VCU	Site	Site Type	Potential NRHP Eligibility
281	49SIT289	Historic Radio Station	No
281	49SIT290	Shell Midden	Yes
279	49SIT301	Shell Midden	Yes
281	49SIT376	Shell Midden	Yes
279	49SIT377	Lithic Scatter	Yes
280	49SIT378	Historic Cabin	No
279	49SIT379	Historic Cabin	No
280	FSDB-1	Modern Charcoal Scatter	No
280	FSDB-2	Modern Charcoal Scatter	No

Source: Wessen et al., 1992

Inventory conducted as part of the current investigation also focused on the near-shore vicinities of Ushk Bay, Deep Bay, and Poison Cove, but additionally provided examination of portions of the shoreline between these locations as well as limited reconnaissance of small areas above 100 feet in elevation. This resulted in the identification of two additional prehistoric sites and two additional historic sites. Additional information on the known sites in the Ushk Bay Project Area is given in Table 3-33. Location information regarding these sites is confidential to prevent unnecessary disturbances to the resources.

In response to public comment received from the Sitka Tribe of Alaska (STA) identifying the presence of smokehouses on the north shore at the head of Ushk Bay, the U.S. Forest Service sponsored a field visit to this area with STA in September 1993 (Myron 1993). The field visit focused on a brief, informal reconnaissance and resulted in the location of a possible culturally modified tree, stumps, and possible garden ridges. While insufficient evidence was found to qualify the location as a "site," the area was noted as having "high potential" for cultural resources, prompting the U.S. Forest Service to conduct additional reconnaissance and systematic soil probing. These investigations resulted in the recordation of two culturally modified trees, but no other cultural resources were noted (Myron 1993).

Chapter 4

Environmental Consequences

Chapter 4
Environmental Consequences

This chapter provides the scientific and analytic basis for the comparison of alternatives presented in Chapter 2. It presents the expected effects on the physical, biological, social, and economic environments associated with implementation of the alternatives. All significant or potentially significant environmental consequences are disclosed, including the direct, indirect, and cumulative effects. These effects may have consequences that are both beneficial and detrimental. Effects are quantified where possible, although qualitative discussions are often necessary.

Chapter 4 begins by detailing the environmental consequences of the alternatives by the same categories used in the description of the affected environment in Chapter 3 (i.e., vegetation, timber, wildlife, etc.). Within each category, the direct, indirect, and cumulative effects are disclosed. Direct environmental effects are defined as those occurring at the same time and place as the initial cause or action. For the purposes of this document, the time period over which the direct effects are expected to occur is 1994 through approximately 2000. Indirect effects are those that occur later in time or are spatially removed from the activity but would be considered important in the foreseeable future. Cumulative effects result from the incremental effects of actions when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

In a Memorandum Order from *Tenakee Springs v. Courtright,* the District Court indicated that the EIS should consider, to the extent of foreseeability, the cumulative impacts on the natural environment of a steadily expanding network of logging roads and cutting units within a Project Area." The reasonably foreseeable time frame over which both indirect and cumulative effects are estimated is here interpreted to mean within 30 years.

The cumulative effects analysis in this document tiers to the current Tongass Land Management Plan (TLMP) EIS and Amendment (USDA Forest Service 1979; USDA Forest Service 1986), and incorporates by reference analysis contained in the Supplement to the Draft Environmental Impact Statement (DEIS) for the TLMP Revision (USDA Forest Service 1991d) and its Planning Record. As a result, the projected cumulative effects include what may be expected from long-term implementation of the TLMP. The decisions made in the Forest Plan provide long-range direction for management of the Tongass National Forest for the duration of the plan. It is important to remember that National Forest plans are reviewed periodically and revised at least every 10 to 15 years.

The cumulative effects identified herein are those projected to occur under any of the action alternatives. However, when the TLMP is revised, decisions made during the revision process can provide for significant changes in management emphasis in any given portion of the National Forest, resulting in changes in projected cumulative effects.

The following assumptions were made to assess reasonably foreseeable effects. These assumptions reflect current management/technology of National Forests and provide a uniform approach to estimating effects of timber harvest and road construction.

- Laws, guidelines, and Best Management Practices (BMPs) for resource protection would be followed. These requirements are expected to be at least as stringent in the future as they are today.
- Timber sale planning would occur in an interdisciplinary fashion.
- All acres of suitable commercial forest land are equally subject to impacts, i.e., timber harvest can occur anywhere on suitable commercial forest land.
- The No-Action Alternative would represent only a delay in implementing the TLMP and, based on volume projections, foreseeable cumulative effects would begin within 30 years, i.e., the No-Action Alternative would only delay timber harvest for a short time.
- Future effects on resources from timber harvest and road construction will be similar to impacts projected for current alternatives.

For the purpose of providing information to analyze reasonably foreseeable effects, timber harvest and transportation system activities have been projected for the next 30 years for the Ushk Bay Project Area. The management emphasis of the current TLMP and TLMP Draft Revision for most of the Project Area is for commodity or market resources and their uses. Future timber management activities were projected for all action alternatives. However, specific future harvest units and roads cannot be identified at this time. Future harvest units would be proposed and analyzed in an interdisciplinary planning effort such as this one.

Chapter 4 concludes with other environmental considerations that must be addressed under the National Environmental Policy Act (NEPA) but do not fall under the categories discussed in Chapter 3. These topics include unavoidable adverse environmental effects, the relationship between short-term uses and the maintenance and enhancement of long-term productivity, the irreversible and irretrievable commitments of resources, possible conflicts between the proposed action and the plans of other jurisdictions, and other environmental considerations.

Timber

Introduction

The proposed action alternatives will have direct, indirect, and cumulative effects on forest vegetation in the Ushk Bay Project Area. This analysis describes the impacts of the timber harvest, including the mix of silvicultural and logging systems, on the productivity of commercial forest land. It also considers the foreseeable effects of timber harvest and the proportion of Volume Classes 6 and 7 proposed for harvest under various alternatives.

Direct Effects

Scope of Harvest

All units planned for harvest were determined to be tentatively suitable land (see Chapter 2). Alternative C proposes to harvest the most acres (3,096), followed by Alternative E (2,783), Alternative F (1,898), Alternative B (1,670), and Alternative D (1,430). The cumulative percentage of tentatively suitable land that would be harvested in the Project Area varies by 20 percent among the alternatives. Alternative C is the highest, harvesting 33.7 percent of tentatively suitable land, while Alternative D is the lowest (17.1 percent). In terms of total land area harvested, the action alternatives vary from a high of 7.8 percent to a low of 3.9 percent.

Table 4-1 shows proposed harvest acreage for each action alternative and percentages of tentatively suitable land, commercial forest land (CFL), and total land area proposed for harvest by alternative and VCU. Appendix K displays unit and road information specific to each alternative.

Table 4-1
Effects of Harvest on Tentatively Suitable Forest Land, Commercial Forest Land, and Total Land Area

				Percent Harvested		
VCU	Past Harvest	Proposed Harvest	Cumulative Harvest	*Tentatively Suitable*	*CFL*	*Land Area*
Alternative B						
279	0	199	199	6.0%	4.5%	2.7%
280	0	298	298	13.6%	7.1%	1.8%
281	321	1,173	1,494	31.5%	17.9%	7.4%
Totals	321	1,670	1,991	19.4%	11.8%	4.5%
Alternative C						
279	0	688	688	20.7%	15.6%	9.2%
280	0	680	680	31.1%	16.3%	4.1%
281	321	1,728	2,092	44.1%	25.1%	10.3%
Totals	321	3,096	3,460	33.7%	20.4%	7.8%
Alternative D						
279	0	288	288	8.7%	6.5%	3.8%
280	0	357	357	16.3%	8.6%	2.1%
281	321	785	1,106	23.3%	13.2%	5.4%
Totals	321	1,430	1,751	17.1%	10.3%	3.9%
Alternative E						
279	0	465	465	14.0%	10.6%	6.2%
280	0	667	667	30.5%	16.0%	4.0%
281	321	1,651	1,972	41.6%	23.6%	9.7%
Totals	321	2,783	3,104	30.0%	18.3%	7.0%
Alternative F						
279	0	199	199	6.0%	4.5%	2.7%
280	0	531	531	24.2%	12.7%	3.2%
281	321	1,168	1,489	31.4%	17.8%	7.3%
Totals	321	1,898	2,219	21.6%	13.1%	5.0%

Source: Smith and Johnson, 1993

Note: Alternative A does not propose any harvest and so is not displayed.

Proposed Harvest by Site Class

More timber can generally be grown in the same period on high productivity site class lands than on medium or low productivity site classes. As a result, it is more economically viable to harvest old-growth, climax forests on higher sites. By replacing old-growth forests on higher sites with young, vigorous trees, the total forest will produce more timber. However, because other factors must be considered in establishing harvesting priorities, timber sales include harvest units from high, medium, and low sites.

Table 4-2 displays harvest acreage by site class and alternative. Site classes 4 and 5 are most productive and site class 1 is least productive. Harvest units in site class 1 were included in all alternatives where their proximity to more productive lands made it possible to economically include them. The majority of the lands harvested in all alternatives is on the medium or better sites. Initial development costs in a previously unroaded area such as Ushk Bay are relatively higher than in more developed forested areas. It is, therefore, more reasonable to include a greater percentage of high sites in order to pay for development costs than in later scheduled harvests which will rely on a previously amortized road system.

Table 4-2

Summary of Proposed Harvest Acreages, by Site Class

	Site Class				
Alternative	*1*	*2*	*3*	*4 & 5*	Total
B	96	80	842	652	1,670
C	239	98	1,340	1,462	3,139
D	81	44	611	695	1,430
E	150	103	1,148	1,382	2,783
F	106	82	890	820	1,898

Source: Smith and Johnson, 1993

Silvicultural Systems

Clearcutting is an even-aged silvicultural system. For hemlock-spruce forests, clearcutting is considered the best method of harvest and is the primary harvest system applied in the Ushk Bay Project Area. In Southeast Alaska, natural regeneration of clearcut stands has been good. Clearcutting is appropriate for old-growth stands with large and often defective timber. In clearcut stands, more sunlight reaches the forest floor; this speeds up decay of organic matter, which improves the productivity of the site (Ruth and Harris 1979). Clearcutting is the most effective means known for controlling dwarf mistletoe (a disease which causes growth loss and is common to the hemlock-spruce forests of the Tongass National Forest). In general, a higher percentage of Sitka spruce regeneration occurs in clearcut stands. Sitka spruce is a desirable timber species which needs more light than hemlock (Harris and Farr 1974). Also, where shallow rooted tree species, shallow soils, and exposure to the effects of severe weather conditions contribute to windthrow, clearcutting is an effective silvicultural system. These factors have been observed to be major contributors for windthrow where selection and shelterwood systems have been attempted (Harris 1989) and are common to the Ushk Bay Project Area.

Six harvest units in Alternative C have a silvicultural objective of minimizing the visual impact of timber harvest when viewed from the Alaska Marine Highway System route through Peril Strait. These units would be harvested with a group selection system rather than clearcutting. Small groups of trees, generally two acres or less, would be harvested from within large stands of old-growth timber. The initial entry would harvest from 15 to 25 percent of the stand. Future harvests would occur at approximately 50-year intervals, resulting in a nominal rotation age of 200 years for the stands. This will allow regeneration of young forest growth interspersed with old-growth trees. Helicopter yarding is proposed in order to minimize logging damage to residual trees within the stand. Timber harvest involving partial removal and the protection of residual trees requires more time, effort, and care by the logging operator; as a result logging costs can be 20 to 50 percent higher. Also, sale administration personnel must understand unit objectives and work closely with the logger to achieve the desired results. Six hundred twenty-two (622) acres would be selectively cut in Alternative C. Only 15 to 25 percent of this area would be harvested in this rotation (about 112 acres). The effects of this partial removal of the standing timber would be similar to the effects described in the following logging systems discussion. However, there would be the benefit of leaving more relatively undisturbed vegetation within the stand, getting a head start on the regeneration of the stand, providing for age and size diversity in the harvested area, and leaving younger, vigorously growing trees.

Logging Systems

A description of the logging systems proposed by alternative is included in Chapter 2 of this EIS. Appendix K displays the logging system proposed for each unit by alternative. This section describes the type and amount of effect expected for each system proposed.

Because shovel logging is permitted only on gentle slopes (less than 20 percent) and on well-drained soils, little adverse impact is predicted. The track-mounted machine generally moves over any one portion of the harvest unit only once and travels on top of logging slash (tree branches and tops) created during the felling and bucking operation. Because of the gentle slopes and the slash mat the machine travels upon there is little opportunity to cut into or compress the soil.

Highlead cable logging drags the logs across the ground surface and can cause some ruts in the soil surface. Where highlead logging is done uphill, the drag corridors radiate down and away from the landing. Water moving downslope is thus dispersed into the harvest unit. Where highlead is done down slope, water tends to accumulate as drag corridors converge at the landing. Slackline and skyline systems are capable of lifting one end of the log or completely suspending the log. The impact of log movement with these systems is much reduced when compared to highlead. Convergence or divergence of drag corridors, while less pronounced than with highlead, are similar with the skyline and slackline systems.

Helicopter yarding systems cause the least impact to the ground surface in that logs are lifted completely off the ground and flown out of the harvest unit to a landing. Generally this system is very costly and used only in situations where high value timber is involved and conventional road access is not possible.

Table 4-4

Comparison of Proposed Harvest Systems

	Alternative									
	B		C		D		E		F	
	Acres	*%*	*Acres*	*%*	*Acres*	*%*	*Acres*	*%*	*Acres*	*%*
Shovel	127	8	264	8	171	12	287	10	214	12
Highlead	70	4	183	6	87	6	198	7	133	7
Skyline	1,296	78	1,780	57	1,064	75	2,025	72	1,373	72
Helicopter	177	10	869[1]	29	108	7	273	11	178	9
Total	1,670		3,096		1,430		2,783		1,898	

Source: Smith and Johnson, 1993

[1] Includes 622 acres of group selection of which approximately 112 acres would be harvested.

Clearcutting is the primary silvicultural system proposed for the Ushk Bay project area.

All of the above systems are capable of clearcut harvest, provided harvest unit design and resource protection requirements are not limiting factors. However, for partial removal of the standing timber in a harvest unit with the objective of retaining advance regeneration, individual trees, or groups of trees, running skyline, live skyline, or helicopter systems are preferred. These systems afford the necessary lift and control of the logs during yarding to prevent damage to residual trees. Table 4-4 shows a comparison of the acres for proposed harvest systems by alternative. Alternative A is not displayed as it proposes no harvest.

The distribution of proposed harvest systems varies by action alternative. Comparatively, skyline systems are proposed for 57 to 78 percent of the acres proposed for harvest; Alternative D proposes the least acres and Alternative E the most acres of skyline yarding. Running skyline is the dominant yarding method for all alternatives. Highlead yarding systems are proposed for 4 to 7 percent of the harvest acres; Alternative B proposes the least highlead and Alternatives C and E the most highlead yarding. Helicopter yarding is proposed for 7 to 29 percent of the acres proposed for harvest. Shovel yarding is proposed for 8 to 12 percent of the harvested area.

Effects on Plant Series

Timber harvest activities would affect forested plant communities, but have little effect on non-forested communities, except for short road segments that may cross non-forested areas. The harvest would convert climax forest stands into young, vigorous successional stands.

The removal of forest overstory would alter microsite conditions that influence the species composition and density of understory vegetation. Species that thrive best in the shaded, protected environment of a mature forest, including herbs, shrubs, lichens, and some mosses, would lose this beneficial influence following harvest, and likely be reduced in vigor and competitive ability. In contrast, species such as huckleberry, salmonberry, and western hemlock merely survive as understory species, but become vigorous competitors for space when released. Other species, such as Sitka spruce, that do not reproduce or survive well in the understory, develop rapidly from seed in open conditions.

Table 4-5 shows proposed harvest acreages for major plant series found in the Ushk Bay Project Area by alternative. See the *Timber* section in Chapter 3 for existing acreages of each plant series.

Table 4-6 summarizes potential harvested acreages for each plant series by alternative. As the table shows, western hemlock is the most widely harvested series in all action alternatives, while mountain hemlock is the least. Alternative A proposes no additional harvest.

Table 4-5
Acres of Proposed Harvest by Major Plant Series

VCU	Plant Series: *Western Hemlock*	*Sitka Spruce*	*Spruce/ Hemlock*	*Other*	Total
Alternative B					
279	35	30	123	11	199
280	37	3	222	36	298
281	103	27	827	171	1,173
Total	175	60	1,217	218	1,670
Alternative C					
279	216	30	367	75	688
280	94	32	470	84	680
281	186	38	1,292	255	1,728
Total	496	100	2,129	414	3,096
Alternative D					
279	37	23	213	15	288
280	45	30	248	34	357
281	49	3	634	99	785
Total	131	56	1,095	148	1,430
Alternative E					
279	112	30	287	36	465
280	93	32	490	52	667
281	183	35	1,224	209	1,651
Total	388	97	2,001	297	2,783
Alternative F					
279	35	30	123	11	199
280	90	32	362	47	531
281	103	28	865	172	1,168
Total	228	90	1,350	230	1,898

Source: Smith and Johnson, 1993

Shovel logging is used on gentler slopes on the Tongass National Forest.

Table 4-6
Summary of Proposed Harvest by Major Plant Series

Alternative	Plant Series: *Western Hemlock*	*Sitka Spruce*	*Spruce/ Hemlock*	*Other*	Total
B	175	60	1,217	218	1,670
C	489	99	2,100	408	3,096
D	131	56	1,095	148	1,430
E	388	97	2,001	297	2,783
F	228	90	1,350	230	1,898

Source: Smith and Johnson, 1993

Indirect and Cumulative Effects

Natural and Artificial Regeneration

A potential effect on some harvest sites is that forest regeneration may not be adequate from natural regeneration, either to the desired stocking level or with desired species composition. Each area proposed for harvest is to be restocked within five years, either by natural or artificial regeneration. The Forest Service plans timber harvest only where it can ensure that affected lands can be regenerated within five years following harvest. Current management prescriptions for harvest units in the Ushk Bay Project Area specify natural regeneration to restock most clearcut units. Artificial regeneration by hand planting would serve as a backup method for units that cannot be certified as adequately regenerated within five years of harvest. Alaska cedar will be hand planted in some units to maintain species composition.

Table 4-7 indicates the number of acres identified for potential hand planting for each action alternative. Although the amount of hand planting needed to maintain species composition can be reasonably estimated, the planting acreages needed to restock cutover areas will not be known until post-harvest stocking surveys indicate the adequacy of natural regeneration. As a result, these figures could change following the survey.

Table 4-7
Acreage Identified for Potential Hand Planting

VCU	Alternative: *B*	*C*	*D*	*E*	*F*
279	0	0	0	0	0
280	0	0	0	0	0
281	469	527	309	532	469

Source: Smith and Johnson, 1993

Precommercial Thinning

Precommercial thinning is a critical forestry tool for managing young-growth forests. Under this procedure, certain trees in young stands are cut in order to concentrate site growth potential in selected "leave trees." In the normal development of a naturally regenerated stand, often as many as 4,000 trees are generated per acre within a few years of initiation of the new stand. During the life of the stand, adjacent trees compete fiercely for sunlight, soil nutrients, and in many parts of the world, soil moisture. Most seedlings eventually succumb to competitive pressures. By the time the stand is approximately 150 years old, stand density will likely drop from several thousand to several hundred or fewer trees per acre, with individual tree growth also drastically reduced. As a result, the stand requires more time to reach merchantable size than it would without this level of competition. Precommercial thinning speeds up nature's cycle by eliminating competition before it seriously affects tree growth, allowing the stand to develop to merchantable size much sooner.

Short-term benefits of precommercial thinning include increased employment and improved habitat quality for a few early seral dependent wildlife species. Long-term benefits that result from accelerated growth generally include faster successional change and higher sawlog volume or equal volume in less time, providing climax stand conditions faster than unthinned second growth stands (USDA Forest Service 1989b).

Precommercial thinning is generally used only on higher index lands where a better response and return on investment can be expected. A site index of 80 was selected as the cutoff point for the Ushk Bay Project Area, with all harvest units averaging a site index of 80 or higher proposed for precommercial thinning (see Chapter 8, *Glossary*, for definition of site index). Table 4-8 displays potential precommercial thinning acreages by alternative. Because precommercial thinning is performed approximately 20 years after harvest depending on site, stocking, and other resource needs, exact acreage totals may change.

Table 4-8

Acreage Identified for Potential Precommercial Thinning

	Alternative				
VCU	*B*	*C*	*D*	*E*	*F*
279	164	312	199	367	199
280	149	584	211	625	531
281	616	952	512	1,006	1,215
Totals	929	1,848	923	1,998	1,945

Source: Smith and Johnson, 1993

Cumulative Timber Harvest

During the long-term contract, 321 acres were harvested in the Project Area, all within VCU 281. No permanent roads were constructed.

The five action alternatives (B-F) propose timber harvesting; no timber would be cut under Alternative A. The fewest acres (1,430) would be harvested under Alternative D, while the most (3,096 acres) would be harvested under Alternative C.

The TLMP Proposed Revised Forest Plan (USDA Forest Service 1991c) lists all timber sales scheduled for harvest before 2010. According to the schedule, no additional timber harvesting is planned for the Ushk Bay Project Area. The cumulative timber harvest, based on the Chatham Area timber-sale schedule (USDA Forest Service 1991c), is displayed in Table 4-9.

Alternative C proposes the highest number of acres for harvest by 2011, while Alternative D proposes the least of the action alternatives. Alternative C would have the greatest cumulative effect on timber resources both in terms of total acres harvested and percent of tentatively suitable (33.7 percent), commercial forest (20.4 percent), and total land area (7.8 percent). Alternative B would have the least impact.

Effects on Long-Term Productivity

Managed Stands

All the action alternatives would increase long-term productivity by converting unmanaged, over-mature stands to managed, more productive, young growth stands. However, because

Alternative A proposes no additional harvest, it provides no opportunity for additional conversion of climax forest to younger, more vigorous stands. Over-mature climax stands grow very slowly, with defect and mortality levels that counterbalance growth, yielding a net effect of zero growth. In addition, the canopy of over-mature trees produces more ground shade than young-growth trees, causing lower forest floor temperatures. The lower temperatures reduce biological activity, slowing organic decomposition and reducing the supply of available nutrients to trees (Harris and Farr 1974). Table 4-10 displays average structural characteristics of managed stands by site index (low, medium, and high). Table 4-11 shows the number of acres converted into managed growth by alternative. Alternative A is not displayed since it proposes no harvest and so converts no additional acres to managed growth.

Second-Growth Stands

All timber proposed for harvest is mature or over-mature and well beyond the age of maximum growth. Uneven-aged western hemlock stands are typical, commonly taking hundreds of years to develop under natural conditions unless manipulated by intensive forest management practices or changed by natural events such as windthrow. The open conditions created by clearcutting allow western hemlock to regenerate rapidly.

Even-aged stands usually contain from 10 to 75 percent spruce, depending on soil type and age of the stand. On average, the percent of spruce in even-aged stands 75 to 100 years after harvest is about 50 percent (Taylor 1934), compared with 28 percent in existing mature and over-mature stands. Silvicultural practices such as precommercial thinning can increase the spruce component by 10 percent or more.

Although log quality in second-growth stands is expected to be lower than in mature and over-mature stands, even on sites that have been precommercially thinned, total yield per acre is expected to be higher in second-growth stands. The lower quality will be reflected in the log grades (sizes), with second-growth timber stands having fewer higher grade logs than existing mature and over-mature stands. In addition, second-growth stands will have less volume in the larger diameter classes. Nevertheless, total yield will be significantly greater in second-growth stands than in mature and over-mature stands. The long-term result of precommercial thinning is the production of more useable fiber. Precommercial thinning also allows the option of reducing the rotation age. This is because merchantable size logs are produced sooner on thinned sites than in areas not thinned.

Most second-growth stands exhibit less variation in tree height and diameter than the mature and over-mature stands they replace. For unmanaged second-growth stands, average diameters range from 10 inches on less productive sites to 14 inches on more productive sites at 100 years old. With several precommercial thinnings, it is possible to produce average stand diameters that equal old-growth averages. Diameters can range from 14 inches on less productive sites to more than 15 inches on productive sites in 100 to 110 years (USDA Forest Service, 1990b).

Plant Community Succession

After reforestation, managed forests grow through several distinctive successional stages. The following discussion on successional changes that occur in the forest after harvest generally applies to all units proposed for harvest. Characteristics such as height, diameter, and productivity vary between sites of different quality, and site classes. Refer to Table 4-10 for these differences between site classes. Different components dominate the stand at different stages, and the overall forest structure changes over time. The following describes these successional stages.

Seedling/Sapling Stage

In the first five years of the seedling/sapling stage, the young stand receives maximum sunlight, resulting in the rapid establishment of a variety of shrubs, forbs, and grasses. There is little inci-

Table 4-9
Cumulative Timber Harvest (in Acres)

Alt	Cumulative Harvest *(acres)*	Percent Harvested *Tentatively Suitable*	*CFL*	*Land Area*
B	1,991	19.4	11.8	4.5
C	3,417	33.7	20.4	7.8
D	1,751	17.1	10.3	3.9
E	3,104	30.3	18.3	7.0
F	2,219	21.6	13.1	5.0

Source: Smith and Johnson, 1993

dence of damage or mortality from disease or infestation at this stage. The changed structure of the young stand affects the structure of adjacent stands; windthrow increases with greater wind exposure, and understory development accelerates because of increased light into the stand (see Chapter 8, *Glossary* for definitions).

In years 5 to 20, seedlings grow into a vigorous new forest with the trees averaging about 19 feet in height and 1 to 3 inches diameter at breast height. Understory production of woody-stemmed species is at its highest at this stage, especially in blueberry-dominated sites. Larger dead materials from the original stand begin to decompose, and the stand edge stabilizes, resulting in less windthrow. At the end of this successional stage, the stand may be precommercially thinned, leaving a species composition of about 60 percent western hemlock, 40 percent Sitka spruce, and less than 2 percent cedar.

Table 4-12 tracks the cumulative acres in the seedling/sapling stage. Alternative E projects the highest number of acres in the seedling/sapling stage after the proposed harvest (2,783 acres), and Alternative D projects the fewest (1,430 acres). No timber harvest is planned for Alternative A, therefore, there would be no change from present conditions.

Pole/Young Sawtimber Stage

At a stand age of 20 to 50 years, during the pole/young sawtimber stage, the forest is dense and the canopy is closing. Tree growth is very rapid, with a gain of about one foot in height per year. At age 50, tree heights range from 48 to 72 feet. Diameters range from 5 to 10 inches, depending on the site class. Tree crowns begin to grow closer together, while the understory changes from a dense shrub-, herb-, and seedling-dominated structure to one of dense moss. Stands which have been precommercially thinned will have a two-layered canopy, with hemlock in the lower story. Canopy closure will occur more slowly in precommercially thinned sites.

In years 50 to 80, the stand remains closed. At age 80, tree heights range from 74 to 107 feet and diameters range from 8 to 13 inches, depending on the site class. Little sunlight reaches the forest floor, and the understory growth continues to be dominated by moss. Tree diameter growth slows to about 1 inch every 10 years, as competition between trees increases. It is not currently economically feasible to commercially thin stands at this age, but thinning would increase understory growth and diversity and would also result in greater tree diameter growth.

Approximately 321 acres were previously harvested in the Project Area and currently exist in the pole/young sawtimber stage. This acreage would remain in the pole/young sawtimber stage through the year 2010 under all alternatives.

Table 4-10

Average Structural Characteristics of Managed Stands, by Site Index

Stand Age (Years)	Height (Feet)	DBH (Inches)	Volume/Acre (Board Feet)
Low Site (Site Index 41 to 68)			
5-20	19	1.3	0
20-50	48	5.1	1,800
50-80	74	7.9	8,500
80-100	88	9.6	18,400
100-120	102	11.2	30,100
120-160	122	14.2	49,200
Medium Site (Site Index 69 to 98)			
5-20	18	2.1	0
20-50	59	8.2	3,900
50-80	93	11.7	20,600
80-100	109	13.5	36,900
100-120	121	14.9	50,100
120-160	137	17.5	67,000
High Site (Site Index 99+)			
5-20	21	2.7	0
20-50	72	9.5	7,500
50-80	107	13.2	36,700
80-100	123	15.1	53,800
100-120	134	16.8	64,900
120-160	151	19.7	83,700

Source: Smith and Johnson, 1993

Table 4-11

Number of Acres Converted to Managed Growth

Alternative	Number of Acres Converted
B	1,670
C	3,096
D	1,430
E	2,783
F	1,898

Source: Smith and Johnson, 1993

Mature Sawtimber Stage

In years 80 to 100, the stand enters the mature sawtimber stage. At age 100, tree heights range from 88 to 123 feet and diameters range from 10 to 15 inches, depending on site class. Some trees may die, while others become clearly dominant in size. Diameter growth remains at less than 1 inch every 10 years. Moss continues to dominate the understory except in places where the canopy has opened and allowed sufficient light for herbaceous plants. These structural characteristics continue into the later stages of the stand (100 to 160 years) with continued slow growth and occasional openings in the canopy. Because none of the existing harvest units or proposed harvest units would grow into this successional stage by 2010, no acres are displayed.

Old-growth Stage

In addition to the above stages for managed stands, Alaback (1984) identified an old-growth stage which would pertain to stands managed for old growth or stands which have not been harvested. The stand becomes overmature. Patches of shrubs, tree saplings, and herbs alternate with patches of overmature timber, creating a complex, multi-layered mosaic. The stand declines in growth and vigor and has the highest degree of variation and the most structurally diverse understory of any successional stage. Table 4-13 presents the acreage of old-growth that existed prior to 1955 and the acreage of old growth that is projected to remain at the end of this project by alternative and VCU.

Although on a VCU basis, there is greater variation between the alternatives, the percentage of the old-growth stage that would remain in the Ushk Bay Project Area varies from 81 percent for Alternative E to 90 percent for Alternative D. There would be an approximate 10 to 19 percent decrease in old-growth acres in the Project Area after implementation of the action alternatives.

Table 4-12

Cumulative Acres in Seedling/Sapling Stage after Harvest

		Alternative					
VCU	**Current**	**A**	**B**	**C**	**D**	**E**	**F**
279	0	0	199	463	288	465	199
280	0	0	298	680	357	667	531
281	0	0	1,173	1,486	785	1,651	1,168
Total	0	0	1,670	2,629	1,430	2,783	1,898

Source: Smith and Johnson, 1993

Table 4-13

Projected Acres of Remaining Old Growth after Harvest

		Alternative					
VCU	**Acres in** *1955*	**A**	**B**	**C**	**D**	**E**	**F**
279	4,285	4,285	4,092	3,762	3,991	3,765	4,092
280	4,098	4,098	3,831	3,462	3,757	3,442	3,601
281	8,038	7,717	6,644	6,228	6,973	6,110	6,641
Total	16,421	16,100	14,567	13,452	14,721	13,317	14,334
Percent of 1955 Acres Remaining		98	89	82	90	81	87

Source:Smith and Johnson,1993

Vegetation

Direct and Indirect Effects

Forested Plant Series

Timber harvest activities would have direct, short-term effects on forested plant communities, including the conversion of climax forest stands into younger, faster-growing successional stands. The removal of forest overstory would change the microsite conditions that have influenced the species composition and density of understory vegetation. Species that thrive best in the shaded and protected environment under the mature forest (such as some mosses, lichens, herbs, and shrubs) would be left without the beneficial influence of trees, reducing their vigor and competitive ability. Some species survive in the understory to become vigorous competitors for growth space when released from the influence of the forest. Examples of such species are blueberry, salmonberry, and western hemlock trees. Other species (e.g., Sitka spruce) that are not notable in the forest understory, can develop rapidly from seed in open conditions.

Construction and maintenance of a road network required for timber harvest would have long-term impacts on vegetation in the Ushk Bay Project Area, because of the greater effects on the soil. The vegetative cover is changed because alder commonly is the dominant colonizer of these highly disturbed areas, presenting the immediate establishment of conifer forest. Succession will probably lead to hemlock forest over time.

Table 4-5 shows the acres of proposed harvest for major plant series in the Ushk Bay Project Area. Western hemlock, Sitka spruce, and spruce/hemlock are the most harvested plant series, with harvest acreages ranging from 1,282 under Alternative D to 2,768 under Alternative C. The least harvested plant series are mixed conifer and mountain hemlock, with harvest expectations ranging from 148 to 414 acres.

Non-Forested Plant Series

Timber harvest activities would have minor effects on non-forested plant communities in the Ushk Bay Project Area. However, road segments and LTFs could affect these communities directly or indirectly. Long-term effects include the loss of non-forested acres where these structures are placed. Indirect impacts include fragmentation of plant communities, impacts to soil moisture regimes, compaction, soil displacement, and erosion.

Techniques and measures required by the Forest Service during road construction tend to preserve the natural values and functions of affected plant communities by reducing indirect impacts. Construction and maintenance of roads and landings will meet Best Management Practices (BMPs). The overall effect on non-forested areas in the Project Area would be negligible, affecting 71 to 336 acres or less than one percent of the Project Area. Table 4-14 shows how many non-forested acres would be affected, directly or indirectly, by each alternative.

Table 4-14

Acres of Proposed Activities on Non-forested Areas

	Alternative				
VCU	B	C	D	E	F
279	16	100	19	49	16
280	19	53	18	51	30
281	65	183	33	148	65
Total	100	336	71	247	111
% Total Non-Forested Acres	0.4	1.3	0.3	1	0.4
% Project Area	0.2	0.7	0.1	0.5	0.2

Source: Confer, 1993

Threatened, Endangered, and Sensitive Plant Species

No plant species known to occur in Southeast Alaska has been determined to be threatened or endangered. Based on surveys and existing knowledge of plant habitats and ranges, it is highly unlikely that any federal or state listed plants occur in the Project Area. As a result, the proposed actions are not expected to affect threatened or endangered plant species. One proposed sensitive species, *Dodecatheon pulchellum var. alaskanum*, was identified in the Project Area in several non-forested plant associations that will not be significantly affected by any of the proposed alternatives. Likewise, up to twelve other species on the Alaska Region Sensitive Species List (USDA Forest Service 1994) could occur in such habitats in the Project Area, although they have not been found. Overall, no effect on the populations of any sensitive species is expected.

Wetlands

Because of the amount of wetland found in the Project Area, timber harvest activities cannot avoid all wetland areas. Approximately 37 percent of the Project Area (16,602 out of 44,503 acres) is classified as wetland, including forested, estuarine, muskeg, alpine meadow, lacustrine, and riparian areas. Many of the wetlands in the Project Area do not support commercial or economic stands of timber and are not scheduled for harvest in this or future harvest proposals. There will be a minor net loss of wetland area from direct impacts of road construction under all project alternatives, except for the No-Action alternative. Soil moisture regimes and vegetation in some wetlands may be altered under some alternatives; however, these altered acres will still function and be classified as wetlands in the ecosystem.

Harvested wetlands may experience temporary changes in site-specific hydrology, with impacts ranging from no changes to alterations in soil moisture regimes, puddling, compaction, soil displacement, and erosion. Wetland areas included within forested areas may be affected by yarding operations within harvest units. Water yield may increase, resulting in a temporary increase in soil moisture until equivalent transpiration and interception surfaces are re-established. Reforestation of wetland sites is expected to be slower than non-wetland sites.

Construction activities in wetlands under proposed project alternatives will include roads, landings, and associated drainage structures. However, wetlands can be logged in ways that maintain their wetland attributes. As noted above, techniques and measures required by the Forest Service for road construction tend to preserve the natural values and functions of affected areas, including wetlands. These techniques include the use of permeable subgrade materials to avoid restricting the natural movement of water and frequent culverts to allow water to pass freely. Such requirements usually limit road construction impacts on wetlands directly underlying the road prism and associated cuts and fills. Less than three percent of all wetlands in the Project Area would be directly affected by road construction under any of the alternatives.

Road construction and maintenance actions will be based on BMPs to ensure that water flows, circulation patterns, and chemical and biological characteristics of wetland water will not be impaired. In addition, use of BMPs will ensure that adverse effects on the aquatic environment are minimized.

Table 4-15 shows the number of wetland acres that proposed project activities will affect either directly or indirectly.

Cumulative Effects on Vegetation

The currently proposed harvest actions would affect 8 to 16 percent of the 19,188 acres of forested vegetation in the Project Area. One-third to one-and-one-half of a percent of the 25,315 acres of non-forested vegetation in the Project Area would be affected. Previous harvest activities have been minor, having affected only 321 acres or less than one percent of the Project Area. There are no foreseeable future harvests planned for the Ushk Bay Project Area.

Cumulative effects on wetlands vary little between alternatives. Because only limited timber harvest and road construction have previously occurred in the Project Area, past disturbances to wetlands have been very minor. The proposed project would have minor effects on wetlands in the Project Area, affecting less than five percent of the total wetland area under any of the action alternatives (Table 4-15). Potential cumulative impacts would be the same for each alternative.

Table 4-15

Acres of Proposed Activities on Wetlands

	Alternative									
	B		C		D		E		F	
VCU	*Units*	*Rds*	*Units*	*Rds*	*Units*	*Rds*	*Units*	*Rds*	*Units*	*Rds*
279	30	8	167	21	57	15	90	23	30	8
280	92	17	140	35	62	34	130	28	112	33
281	279	39	377	54	166	41	343	59	279	44
Sub-total	401	64	684	110	285	90	563	110	421	85
Total	465		794		375		673		506	
% Total Wetland Acres	2.8		4.8		2.3		4.1		3.1	
% Project Area	1.0		1.2		0.8		1.5		1.1	

Source: Confer, 1993

Some wetlands occur in the understory of old-growth forest vegetation.

Wildlife

Information from Chapter 3, *Affected Environment*, provides the basis for evaluating impacts on the various wildlife habitats, Management Indicator Species, and biological diversity. The analysis considers the direct, indirect, and cumulative effects from timber management in the Project Area. Effects are projected to the end of the proposed actions.

Direct and Indirect Effects

Wildlife Habitat

Except for Alternative A, the No-Action Alternative, each alternative unavoidably affects wildlife habitat. The impacts of habitat loss on Management Indicator Species is discussed below in the *Management Indicator Species and Habitat Capability* section. However, as provided under every alternative, project unit design criteria, best management practices, and legislated protective measures significantly reduce impacts to beach fringe, estuary fringe, and riparian habitats.

Old-Growth Forest

Old-growth forest is generally characterized and inventoried as productive forest land over 150 years old with timber volumes greater than 8,000 board feet per acre and average diameters greater than 9 inches. Refer to the *Wildlife Habitat* section in Chapter 3 for additional information regarding old-growth forest. All acres scheduled for timber harvest are assumed to be old-growth forest. Table 4-16 shows the acreage of old growth in the proposed harvest units and roads in each VCU by alternative, compared with the total old-growth acreage in 1992. Timber harvesting and road construction under Alternative C would result in the loss of 3,203 acres of old-growth forest, or 20 percent of the total old growth in the Project Area. Alternative E would result in the loss of 2,857 acres of old-growth forest, or 18 percent of the total old growth in the Project Area. Alternatives B, D, and F would result in the loss of 1,703, 1,503, and 1,941 acres of old growth, respectively. All alternatives have sufficient areas of old growth remaining to meet the old growth retention standards in the TLMP. The effects of old-growth habitat loss on old-growth dependent species are reflected in the *Management Indicator Species and Habitat Capability* section of this chapter.

Table 4-16

Acreage of Old-Growth Habitat in Proposed Harvest Units and Roads

	VCU 279	VCU 280	VCU 281	Total	Percent Change
Total Acres, 1992	4,285	4,098	7,717	16,100	—
Alternative					
A	0	0	0	0	0
B	206	298	1,199	1,703	11
C	696	688	1,819	3,203	20
D	303	374	826	1,503	9
E	486	670	1,701	2,857	18
F	205	536	1,200	1,941	12

Source: Artman, 1993

Forest

Forest habitat includes all old-growth forest as well as nonproductive forest, subalpine forest, and immature forest. All acres proposed for timber harvest under the alternatives are necessarily forest habitat as well as old-growth habitat. The proposed roads include both old-growth forest and other forest types. Each alternative would impact 9 percent or less of the total forest habitat in the Project Area. Table 4-17 shows the changes in forest habitat within VCUs by alternative, compared with existing acreage in 1992. Timber harvesting and road construction under Alternatives C and E would impact 3,216 and 2,870 acres, respectively, while Alternatives B, D, and F would impact 1,714, 1,516, and 1,952 acres, respectively.

Table 4-17

Acreage of Forest Habitat in Proposed Harvest Units and Roads

	VCU				Percent
	279	*280*	*281*	**Total**	**Change**
Total Acres, 1992	7,251	12,155	15,044	34,450	—
Alternative					
A	0	0	0	0	0
B	206	298	1,210	1,714	5
C	696	688	1,832	3,216	9
D	303	374	839	1,516	4
E	486	670	1,714	2,870	8
F	205	536	1,211	1,952	6

Source: Artman, 1993

Note: The acreage of forest habitat is higher than the acreage of old-growth forest because the forest habitat includes portions of the roads that are forested but do not meet the definition of old-growth.

Riparian

Riparian habitat is defined by the presence of stream channels, riparian soils, and riparian vegetation associations (West et al. 1989). Riparian habitat varies in width but generally is wider than the riparian buffers defined under the Tongass Timber Reform Act (TTRA).
Table 4-18 shows the changes in acreage of riparian habitat within VCUs by alternative, compared with existing acreage in 1992. Timber harvesting and road construction under Alternatives C and E would impact 962 and 977 acres, respectively, or 19 to 20 percent of the total riparian habitat in the Project Area. Alternatives B, D, and F would impact 570, 539, and 751 acres of riparian habitat, respectively. Road crossings through riparian buffers have been minimized and are expected to have minimal effect on TTRA buffer effectiveness.

Beach Fringe

Beach fringe habitat is defined as acreage within 500 feet of marine water. The percent of proposed harvest and road acreage in beach fringe areas is four percent or less for each alternative. Table 4-19 shows the changes in acreage of beach fringe habitat within VCUs by alternative, compared with existing acreage in 1992. Timber harvesting and road construction under Alternatives C, D, and E would impact 79, 54, and 86 acres, respectively. Alternatives B and F would each affect 35 acres of beach fringe habitat.

Estuary Fringe

Estuary fringe habitat is defined as acreage within 1,000 feet of the mean high water line along an estuary. The percent of harvest and road acreage in estuary fringe habitat is eight percent or less for each alternative. Table 4-20 shows the changes in acreage of estuary habitat within

Table 4-18

Acreage of Riparian Habitat in Proposed Harvest Units and Roads

	VCU 279	VCU 280	VCU 281	Total	Percent Change
Total Acres, 1992	669	1,641	2,653	4,963	—
Alternative					
A	0	0	0	0	0
B	92	80	398	570	12
C	158	297	507	962	19
D	86	173	280	539	11
E	157	292	528	977	20
F	92	258	401	751	15

Source: Artman, 1993

Table 4-19

Acreage of Beach Fringe Habitat in Proposed Harvest Units and Roads

	VCU 279	VCU 280	VCU 281	Total	Percent Change
Total Acres, 1992	933	287	842	2,062	—
Alternative					
A	0	0	0	0	0
B	3	0	32	35	2
C	16	2	61	79	4
D	14	4	36	54	3
E	15	0.5	70	86	4
F	3	0	32	35	2

Source: Artman, 1993

VCUs by alternative, compared with existing acreage in 1992. Timber harvesting and road construction under Alternatives C, D, and E would impact 180, 135, and 184 acres, respectively. Alternatives B and F would each affect 84 acres of estuary fringe habitat.

Alpine

No timber harvesting or road construction would occur in alpine habitat under any of the proposed alternatives.

Comparison of Alternatives

Except for Alternative A (no action), each alternative would have a pronounced direct effect on wildlife habitats: the change of old-growth forest habitat to early successional habitat. Table 4-21 shows the changes in each habitat type by alternative, compared with 1992 acreage. Alternatives C and E would have the greatest direct impact on old-growth forest, riparian, beach fringe, and estuary fringe habitat. Alternative D would have the least direct impact on old-growth forest and riparian habitat, while Alternatives B and F would have the least direct impact on beach fringe and estuary fringe habitat.

Table 4-20
Acreage of Estuary Fringe Habitat in Proposed Harvest Units and Roads

	VCU 279	VCU 280	VCU 281	Total	Percent Change
Total Acres, 1992	767	448	1,004	2,219	—
Alternative					
A	0	0	0	0	0
B	10	0	74	84	4
C	51	11	118	180	8
D	23	11	101	135	6
E	50	0.2	134	184	8
F	10	0.2	74	84	4

Source: Artman, 1993

Table 4-21
Total Acreage of Wildlife Habitat in Proposed Harvest Units and Roads

	Habitat: *Old-growth Forest*	*Forest*	*Riparian*	*Beach Fringe*	*Estuary Fringe*
Total Acres, 1992	16,100	34,450	4,963	2,062	2,219
Alternative					
A	0	0	0	0	0
B	1,703	1,714	570	35	84
C	3,203	3,216	962	79	180
D	1,503	1,516	539	54	135
E	2,857	2,870	977	86	184
F	1,941	1,952	751	35	84

Source: Artman, 1993

Note: The acreage of forest habitat is higher than the acreage of old-growth forest because the forest habitat includes portions of the roads that are forested but do not meet the definition of old-growth.

Management Indicator Species and Habitat Capability

The previous section discusses changes to habitats used by Management Indicator Species. This section discusses how habitat changes could affect the potential habitat capability for each Management Indicator Species. Habitat Capability Models are used to estimate the capability of habitats to support Management Indicator Species populations. The models are not accurate reflections of actual population levels in the Ushk Bay Project Area. Current population levels are presently unknown. However, the models provide the best available tool for quantifying and comparing effects of proposed alternatives on Management Indicator Species habitats.

Sitka Black-Tailed Deer

Harvesting old-growth forest in the Project Area would reduce the suitability of habitat for Sitka black-tailed deer. Four types of impacts would result from clearcutting old-growth forest (Hanley 1984): (1) logging slash makes it difficult for deer to pass through clearcuts, and reduces available habitat; (2) lack of snow interception in clearcuts reduces the availability of forage during winter; (3) the nutritional quality of plants growing in open sunny clearcuts would be lower than plants growing in shaded old-growth forests; and (4) forage production would be significantly reduced following canopy closure of the regenerating forest, and would remain low for at least 100 years.

Table 4-22

Changes in Habitat Capability for Sitka Black-tailed Deer

	VCU 279	VCU 280	VCU 281	Total	Percent Reduction
Habitat Capability in 1992	375	404	606	1,385	—
Resultant Habitat Capability by Alternative					
A	375	404	606	1,385	0
B	364	387	529	1,281	8
C	340	364	500	1,205	13
D	355	384	550	1,289	7
E	342	364	490	1,195	14
F	364	374	529	1,267	9

Source: Artman, 1993

The Habitat Capability Model analyzes these impacts on Sitka black-tailed deer according to expected changes in habitat conditions and resulting changes in the carrying capacity of the Project Area. Model results indicate that Alternatives C and E would reduce habitat capability 13 to 14 percent, while Alternatives B, D, and F would reduce habitat capability 7 to 9 percent (Table 4-22).

The acreage of deer winter range that would be impacted by the proposed project is shown in Table 4-23. The range of alternatives would impact 173 to 330 acres of high quality deer winter range, or between 21 and 41 percent of the high quality deer winter range in the Project Area. Of the action alternatives, Alternative E would impact the most high quality deer winter range and Alternative D would impact the least.

Timber harvesting would also affect habitat for Sitka black-tailed deer by fragmenting large blocks of old growth into small patches through clearcutting. Fragmentation causes two potential impacts: (1) deer may concentrate in remaining small patches of old-growth habitat, resulting in overuse of forage and reduced carrying capacity; and (2) windthrow along the edges of clearcuts may effectively decrease available habitat area for deer (Hanley 1984). Although the effects of habitat fragmentation have not been incorporated into the Habitat Capability Model, some authors have assumed that contiguous patches of old growth larger than 1,000 acres provide optimal wintering habitat conditions for Sitka black-tailed deer (Suring et al. 1992a). Timber harvesting would reduce the size of most old-growth forest patches in the Project Area to less than 1,000 acres.

Road construction would affect Sitka black-tailed deer by improving hunter access to the Project Area. Open access roads would have greater impacts on deer harvest than roads closed to ve-

Table 4-23.

Acreage of Sitka Black-tailed Deer Winter Range in Proposed Harvest Units

	Acres of Habitat by Quality Rating[1]		
	Low Quality	*Moderate Quality*	*High Quality*
Total Acres, 1992	40,227	3,469	806
Alternative			
A	0	0	0
B	996	514	203
C	1,503	1,020	319
D	837	445	173
E	1,552	1,149	330
F	1,337	405	203

1 Low Quality: HSI = 0 - 0.4
Moderate Quality: HSI = 0.4 - 0.6
High Quality: HSI = 0.6 - 1.0

hicular traffic. Closed roads, however, might support some level of off-road vehicle use for several years following logging. In addition, all roads, regardless of closure, can potentially support human foot traffic. Improved road access under each of the action alternatives could result in greater hunter success for deer. The potential for overharvesting and the attendant need for more restrictive game management would be higher under Alternatives C and D, in which roads would remain open following timber harvest, than under Alternatives B, E, and F, in which roads would be closed following timber harvest. In addition, under Alternatives D, E, and F, the proposed road system between Ushk Bay, Poison Cove, and Deep Bay would be interconnected through high elevation subalpine habitat. This high elevation road would improve hunter access to subalpine and alpine habitat where deer occur during summer. Thus, the potential for overharvesting deer would be highest under Alternative D because of the combined effect of open access roads and the interconnected road system.

Brown Bear

Harvesting old-growth forest along low elevation stream valleys in the Ushk Bay Project Area would reduce and disturb foraging habitat for brown bears. Theoretically, clearcuts should provide suitable habitat for brown bears because of the abundant production of forage plants during early stages of forest succession. However, research on Chichagof Island indicates that brown bears generally avoid clearcuts, possibly because other sites provide more nutritious foraging and better cover (Schoen and Beier 1989).

The Habitat Capability Model analyzes the effects of clearcutting on brown bears by modeling the potential change in carrying capacity of the Project Area according to the expected change in habitat conditions. Impacts of human disturbance were not incorporated into the Habitat Capability Model results. Model results indicate that all action alternatives would decrease habitat capability by 9 percent or less in the Project Area. Alternatives C and E would reduce habitat capability 9 percent, while Alternatives B, E, and F would reduce habitat capability 5 to 7 percent (Table 4-24).

Road construction in the Project Area would also affect brown bears by improving human access and consequently increasing disturbances as well as human-caused mortality of bears.

Table 4-24.
Changes in Habitat Capability for Brown Bear

	VCU				Percent
	279	*280*	*281*	**Total**	**Reduction**
Habitat Capability in 1992	12	20	26	58	—
Resultant Habitat Capability by Alternative					
A	12	20	26	58	0
B	12	20	24	55	5
C	11	19	23	53	9
D	12	19	25	55	5
E	11	19	23	53	9
F	12	19	24	54	7

Source: Artman, 1993

Roads increase access for hunters and poachers, the probability of vehicle-bear collisions, and the frequency of energy-intensive flight responses by bears (McLellan and Shackleton 1988). Roads remaining open would have greater impacts on bears than roads closed to vehicular traffic, although closed roads could support some level of off-road vehicle traffic for several years following logging. Thus, brown bears could be affected by human disturbances under each of the action alternatives. The likelihood of disturbance is greater under Alternatives C and D, in which roads would remain open to the public following logging.

Marten

Harvesting old-growth forest in the Ushk Bay Project Area would reduce habitat for marten. Clearcutting eliminates resting sites, winter hunting sites, overhead cover, and preferred prey (Suring et al. 1992b). Marten generally avoid open habitats such as clearcuts because deep snow during winter and dense vegetative growth during summer prevents successful foraging (Steventon and Major 1982). Populations of red squirrels, a primary food source for marten in Southeast Alaska, have been shown to decline significantly following clearcutting (Wolff and Zasada 1975; Medin 1986). Although clearcuts retain some habitat value for marten because residual slash provides overhead cover and some less-preferred prey species are available, research results indicate that clearcut use by marten is very limited in Southeast Alaska (Suring et al. 1992b).

The Habitat Capability Model analyzes the effects of timber harvesting on the carrying capacity of habitat for marten in the Ushk Bay Project Area. Impacts of logging roads were not incorporated into the Habitat Capability Model Results. Results of the model show that Alternatives C and E would reduce habitat capability 11 percent each, while Alternatives B, D, and F would reduce habitat capability 7 to 9 percent (Table 4-25).

Construction of logging roads would cause additional impacts to marten in the Project Area. Logging roads improve access for trappers which could potentially result in overharvesting of resident marten populations. Roads remaining open would have greater impacts on marten than roads closed to vehicular traffic, although closed roads could support some level of off-road vehicle traffic for several years following logging. Thus, under each of the action alternatives, it is possible that marten could be overharvested as a result of improved access on logging roads. The potential for overharvesting is higher under Alternatives C and D in which the roads would remain open following timber harvest, than under Alternatives B, E, and F in which the roads would be closed after harvest.

Table 4-25
Changes in Habitat Capability for Marten

	VCU 279	VCU 280	VCU 281	Total	Percent Reduction
Habitat Capability in 1992	16	19	28	63	—
Resultant Habitat Capability by Alternative					
A	16	19	28	63	0
B	15	18	25	58	9
C	15	17	23	55	14
D	15	18	26	59	7
E	15	17	23	55	14
F	15	18	25	58	9

Source: Artman, 1993

River Otter

Harvesting old-growth forest and constructing logging roads along shorelines and streams in the Ushk Bay Project Area would reduce habitat for river otters. Results of the Habitat Capability Model indicate that Alternatives C and E would reduce habitat capability 21 percent each, while Alternatives B, D, and F would reduce habitat capability 15 to 18 percent (Table 4-26).

Hairy Woodpecker

Harvesting old-growth forest in the Ushk Bay Project Area would result in loss of habitat for hairy woodpeckers. This species prefers high volume old-growth forest habitat for foraging and nesting (Suring et al. 1988). During the regeneration stage of even-aged timber management, forests have little potential for hairy woodpecker habitat (Conner et al. 1975). Snags that develop in second-growth forests are not used by hairy woodpeckers or other cavity-nesting wildlife because the snags are generally too small for excavation (Chadwick et al. 1986). Remnant snags in second-growth stands receive very little use by woodpeckers because of the high

Table 4-26
Changes in Habitat Capability for River Otter

	VCU 279	VCU 280	VCU 281	Total	Percent Reduction
Habitat Capability in 1992	13	9	15	37	—
Resultant Habitat Capability by Alternative					
A	13	9	15	37	0
B	12	8	12	32	15
C	12	7	11	29	21
D	12	8	12	32	15
E	12	7	11	29	21
F	12	7	12	30	18

Source: Artman, 1993

stem density of trees which is unsuitable for woodpeckers (Mannan et al. 1980).

The Habitat Capability Model analyzes the effects of timber harvesting on habitat for hairy woodpeckers. Results of the Habitat Capability Model are shown in Table 4-27. Alternatives C and E would reduce habitat capability 16 to 17 percent, and Alternatives B, D, and F would reduce habitat capability 8 to 11 percent.

Table 4-27
Changes in Habitat Capability for Hairy Woodpecker

	VCU 279	VCU 280	VCU 281	Total	Percent Change
Habitat Capability in 1992	69	66	141	276	—
Resultant Habitat Capability, by Alternative					
A	69	66	141	276	0
B	66	61	123	250	9
C	58	56	114	228	17
D	64	60	128	253	8
E	62	56	115	233	16
F	66	58	123	247	11

Source: Artman, 1993.

Brown Creeper
Harvesting old-growth forest in the Ushk Bay Project Area would result in loss of habitat for brown creepers. This species prefers high volume old-growth forest habitat for foraging and nesting (Suring et al. 1988). Studies of the response of birds to timber harvest have shown substantial reductions of populations of brown creepers from old-growth forests to clearcuts (Franzreb 1977, Scott and Gottfried 1983, Medin 1985).

The Habitat Capability Model analyzes the effects of timber harvesting on habitat for hairy woodpeckers. Results of the Habitat Capability Model are shown in Table 4-28. Alternatives C and E would reduce habitat capability for brown creepers 17 to 18 percent. Alternatives B, D, and F would reduce habitat capability 9 to 11 percent.

Comparison of Alternatives
The main direct effect on wildlife habitats under each action alternative is reduced habitat capability of the Project Area for each Management Indicator Species. Table 4-29 shows the changes in habitat capability by Management Indicator Species and alternative, compared with habitat capability in 1992. Alternatives C and E would result in the greatest reductions in habitat capability for management indicator species because the most old-growth forest would be harvested under these alternatives.

The potential for overharvesting deer and marten, and disturbance of brown bears could occur under any of the action alternatives. The likelihood of these effects is greater under Alternatives C and D, in which roads would remain open following logging, than under Alternatives B, E, and F, in which roads would be closed following logging.

Both direct and indirect effects on habitat capabilities for Management Indicator Species are largely unavoidable under all action alternatives since the effects are a result of timber harvest.

Table 4-28.
Changes in Habitat Capability for Brown Creeper

	VCU 279	280	281	Total	Percent Change
Habitat Capability in 1992	17	27	45	—	
Resultant Habitat Capability, by Alternative					
A	17	27	45	89	0
B	16	25	38	80	11
C	14	23	36	73	18
D	15	25	41	81	9
E	14	23	36	74	17
F	16	24	39	80	11

Source: Artman, 1993.

Bald Eagle

Nesting bald eagles are vulnerable to human disturbance. However, because they vary considerably in their response to human activity, it is difficult to predict the effects of specific disturbances on individual eagles (Sidle et al. 1986). Potential disturbance activities of proposed project actions include road construction, timber harvest, helicopter flights, and truck and heavy equipment traffic. Decreased survival or productivity of nesting bald eagles is an important management concern (Sidle et al. 1986). The Bald Eagle Protection Act protects the bald eagle and protects their nests from harm.

Under a Memorandum of Understanding (MOU) between the Forest Service and the Fish and Wildlife Service (FWS), bald eagle nesting habitat and activities are to be protected by a 330-foot radius habitat management zone around each bald eagle nest tree. Activities inconsistent with current bald eagle use are restricted within this zone. In addition to the protective zone, the

Table 4-29
Changes in Habitat Capability for Management Indicator Species

	Sitka Black-tailed Deer	Brown Bear	Marten	River Otter	Hairy Woodpecker	Brown Creeper
Habitat Capability in 1992	1,385	58	63	37	276	89
Resultant Habitat Capability, by Alternative						
A	1,385	58	63	37	276	89
B	1,281	55	58	32	250	80
C	1,205	53	55	29	228	73
D	1,289	55	59	32	253	81
E	1,195	53	55	29	233	74
F	1,267	54	58	30	247	80

Source: Artman, 1993

MOU recommends that a continuous fringe of mature trees, 660 feet wide, be maintained along the coastline to provide perching and winter roosting habitat for bald eagles.

Variances from the MOU must be obtained if encroachment upon the 330-foot zone by a proposed land use activity appears unavoidable. Variances have been obtained to enter the 330-foot zones of four bald eagle nest sites in the Ushk Bay Project Area, as shown in Table 4-30 (see Appendix N for documentation). There will be no road construction work within 330 feet of the four nest trees from March 1 to May 31 to permit eagles to initiate nesting activities. This period will continue to August 31 if the nest is occupied by eagles. The nest sites will be checked by a Forest Service biologist during May to determine its use by eagles. No blasting will occur within 1/2 mile of the nest from March 1 to May 31, and this period will continue to August 31 if the nest is occupied by eagles. Cutting of trees within 330 feet of the nests will be the absolute minimum required for the road rights-of-way.

In addition to the 330-foot habitat management zone, the MOU recommends that repeated helicopter flights be avoided within one-quarter mile of active bald eagle nests, and that helicopter logging flight corridors maintain at least a one-quarter mile distance from the nests. Variances have been obtained to conduct helicopter operations within one-quarter mile of bald eagle nests in the Ushk Bay Project Area along the Peril Strait shoreline from Ushk Bay to Deep Bay. No helicopter operations will occur during the bald eagle nesting season if the nest is occupied (March 1 to August 31).

Table 4-30

Variances for Road Construction Within 330 Feet of Bald Eagle Nest Sites

Bald Eagle Nest Number	Location	Reason for Variance	Proposed Alternatives
3	South Poison Cove	Road 7516-65 within 200 feet of nest site	B,F
90	North Poison Cove	Road 7516 within 100 feet of nest site	B,F
91	North Poison Cove	Road 7516 within 150 feet of nest site	C,D,E
100	Goal Creek	Road 7517 within 150 feet of nest site	C,E

Source: Artman, 1993

Consumptive Use of Wildlife

The availability of wildlife for hunters and trappers could be affected by the proposed action in the following ways: (1) reduced habitat capability could decrease availability over time; (2) new roads could increase availability of wildlife through improved access; and (3) the presence of resident camps could temporarily increase demand for wildlife. Future hunter demand could further impact the availability of wildlife. The principal species sensitive to management activities and overharvesting are Sitka black-tailed deer, brown bear, marten, and river otter.

Habitat capabilities for WIldlife Analysis Area (WAA) 3311 were compared to average harvest levels reported by ADF&G for WAA 3311 to determine if existing or resulting habitat capabilities are adequate to meet hunter demand. This comparison is shown in Table 4-31.

Habitat capability for Sitka black-tailed deer does not appear sufficient to support a population capable of sustaining the average level of harvest from 1988 to 1992 under any of the alternatives, including Alternative A (no-action alternative). Habitat capabilities even before 1954 probably were not sufficient to support the average harvest in WAA 3311. The sustainable harvest level is estimated to be 10 percent of the deer population (Flynn and Suring 1989). However, the average harvest level is 15 percent of the existing habitat capability under Alternative A and would increase to 17 to 18 percent of the resultant habitat capability under the proposed action alternatives (Table 4-31).

ADF&G's deer population objective for WAA 3311 is equivalent to the current habitat capability of WAA 3311 (1,433 deer). All of the action alternatives would reduce habitat capability levels below ADF&G's population objective. Alternative E would result in the greatest reduction in deer habitat capability and Alternative B would result in the lowest reduction.

Table 4-31

Average Harvest Levels of Management Indicator Species Compared with Estimated Habitat Capability for WAA 3311

	Sitka black-tailed deer	Brown bear	Marten	River otter
Average Harvest per Year (1988-1992)	228	2	33	9
Population Needed to Support Harvest	2,280	40	84	45
Habitat Capability in 1954	1,482	70	76	48
Habitat Capability in 1992	1,443	69	74	45
Resultant Habitat Capability by Alternative				
A	1,443	69	74	45
B	1,339	66	69	40
C	1,236	64	66	37
D	1,347	66	70	40
E	1,253	64	66	37
F	1,325	65	69	38

Source: Artman, 1993

Habitat capability for marten also does not appear sufficient to support a population capable of sustaining the average harvest level from 1988 to 1992 under any of the alternatives, including Alternative A. Habitat capability in 1954 also does not appear to support the average harvest level of marten in WAA 3311. The sustainable harvest level is estimated to be 40 percent of the population (Flynn 1992). However, the average harvest level from 1988 to 1992 was 45 percent of the existing habitat capability estimate, as represented under Alternative A, and would increase to 47 to 50 percent of the resulting habitat capabilities under Alternatives B-F.

The habitat capability for river otter does not appear sufficient to support a population capable of sustaining the average harvest levels from 1988 to 1991 under Alternatives B-F. The sustainable harvest level is estimated to be 20 percent of the population (Larsen 1983). The average harvest level from 1988 to 1992 was 20 percent of the current habitat capability, but would increase to 23 to 24 percent of the resulting habitat capability under Alternatives B-F.

Habitat capability for brown bears is sufficient to support current harvest levels under Alternative A, the No-Action Alternative, but not under Alternatives B-F. An average of 2 brown bears, or approximately 3 percent of the existing habitat capability, was harvested per year between 1988 and 1992. The average harvest level would increase to 3 percent of the resulting habitat capabilities under Alternatives B-F. The sustainable harvest level for brown bears is variable depending on the suitability of habitat conditions, but is generally considered to be 4 percent (Schoen, pers. comm.).

Threatened, Endangered, Candidate, and Sensitive Species

Four federally listed and three federal candidate species occur in or adjacent to the Ushk Bay Project Areas. None of the three wildlife species designated as sensitive by the Alaska Region of the Forest Service, other than the listed or candidate species, are known to occur in the Project Area. For more information on threatened and endangered species, see the Biological Assessment in Appendix J.

Threatened and Endangered Species

Humpback Whale

The only proposed activities likely to result in impacts to humpback whales are the development and use of log transfer facilities (LTFs) and their associated camps and the movement of log rafts from LTFs to mills. Construction and operation of LTFs and other docking facilities are restricted to small, very localized areas of the marine environment. From one to four LTFs are proposed for the Ushk Bay Project Area. A maximum of 2.5 acres of marine benthic communities would be disturbed as a result of bark accumulation at each LTF.

Construction and operation of LTFs are unlikely to affect prey availability for humpback whales. The permitting process for LTFs requires that monitoring be conducted to maintain water quality and marine circulation and flushing during construction and operation of LTFs. As a result of the permitting requirements, no impacts are anticipated to the marine environment which would affect humpback whale prey species.

Humpback whales could be disturbed by increased boat traffic associated with LTFs. Log raft towing occurs at relatively constant speeds and directions, and is less likely to elicit avoidance behavior from whales than other types of boating activity. Recreational boating by LTF workers involves frequent changes in speed and direction. Disturbance impacts would be localized in nature, and would be highly variable, depending on many factors, such as the size of the bay, water depth, number of boats, and individual behavioral responses of humpback whales. Behavioral responses could include sounding, breaching, evasive underwater maneuvers, and maintaining distance. Indirect effects from boating activity will be negated by Forest-wide standards and guidelines in the Proposed Revised Forest Plan (USDA Forest Service 1991c, page 4-69).

Steller Sea Lion

Harassment or displacement of Steller sea lions from preferred habitats by human activities such as boating, recreation, aircraft, log transfer facilities, and log raft towing is a concern with regard to long-term conservation of the sea lion in Southeast Alaska. Forest-wide standards and guidelines will be followed to prevent and/or reduce potential harassment of Steller sea lions and other marine mammals due to Forest management activities. These standards and guidelines are listed on pages 4-68 and 4-69 in the Proposed Revised Forest Plan (USDA Forest Service 1991c).

LTF construction and operation are unlikely to affect prey availability for Steller sea lions, since these and related activities are restricted to small, very localized areas of the marine environment. In addition, the permitting process for LTFs requires that monitoring be conducted to maintain water quality and marine circulation and flushing during construction and operation of LTFs. As a result, prey for Steller sea lions is unlikely to be affected.

American and Arctic Peregrine Falcons

The American and Arctic peregrine falcons would not be affected as a result of any of the proposed alternatives. These two subspecies occur in Southeast Alaska only during migration. Peregrine falcons generally occur in areas of high prey densities, such as seabird rookeries or waterfowl concentration areas. No seabird rookeries or waterfowl concentration areas are located in the Ushk Bay Project Area.

Candidate Species

Marbled Murrelet

Marbled murrelets nest in old-growth forest stands up to 53 miles from saltwater. Marbled murrelets more commonly occupy larger stands (greater than 500 acres) than smaller stands (less than 100 acres). Since all inland forest stands in the Ushk Bay Project Area are less than 8 miles from salt water, all could be potential marbled murrelet nesting habitat. Without precise knowledge of marbled murrelet nesting habitat requirements, all old-growth habitat with greater than 8,000 board feet per acre is assumed to be suitable for nesting.

All action alternatives will harvest stands which may be capable of providing nesting habitat for marbled murrelets. The amount of old-growth currently being used by marbled murrelets is unknown. The factors currently limiting marbled murrelets in Southeast Alaska have not been identified. Assuming that availability of nesting habitat is a limiting factor for the population, then a reduction in availability of nesting habitat could result in a proportional effect on the population. In the Ushk Bay Project Area, between 9 and 20 percent of the old-growth forest habitat would be harvested, potentially resulting in a 9 to 20 percent reduction in the marbled murrelet population using the Project Area.

However, this proportionate analysis assumes no influence caused by habitat fragmentation or increased edge, and a uniform use of the available suitable habitat. Adding in these two factors would likely increase the estimated adverse effect of the proposed action on marbled murrelets. Habitat fragmentation results in increased predation on nests of forest birds, and also allows for increases in populations of predators. Corvids (i.e., crows, ravens, and jays) are edge species that increase in numbers in proportion to increases in the amount of edge. Marbled murrelet nests are highly susceptible to predation, primarily by corvids (S.K. Nelson, personal communication). Thus, it follows that habitat fragmentation has an effect on marbled murrelet nesting success. The size of old-growth forest patches is also important because marbled murrelets nest in loose colonies or aggregations. Research is currently being conducted in the Pacific Northwest to determine optimal stand size for marbled murrelets.

In summary, the Ushk Bay Project may affect marbled murrelets, but the extent of this impact is not quantifiable at this time. The Project Area is only a small fraction of the presumably suitable habitat in Southeast Alaska and any effects from this project would have minimial impact on the overall population in Southeast Alaska.

Murrelet nests are exceedingly difficult to find, and no intensive nest searches in Ushk Bay units are planned. However, if any nests are discovered, they will be protected by a minimum 30 acre buffer around the nest tree. The intent of the 30 acre buffer is to maintain the integrity of microsite conditions within the forest interior (C. Iverson, personal communication). If research, monitoring, or administrative studies uncover new information addressing marbled murrelets in Southeast Alaska, they will be reviewed for use in and/or replacement of this guideline. Draft 1991 Interim Management Guidelines for Marbled Murrelet Habitat Conservation in Washington, Oregon, and California call for maintaining all contiguous suitable habitat in stands less than 480 acres where murrelet occupancy during the breeding season is determined.

Northern Goshawk

Harvesting old-growth timber could reduce the quality and availability of nesting habitat for northern goshawks in the Ushk Bay Project Area. Types of impacts from timber harvesting could include reduced foraging habitat quality, reduced prey densities, and increased competition from red-tailed hawks and other raptors (Crocker-Bedford 1990a). These effects could potentially result in reduced population levels and reduced nesting success of northern goshawks (Crocker-Bedford 1990a).

Northern goshawks are known to occur in the Ushk Bay Project Area, but goshawk nesting activity has not been documented in the Project Area. Any northern goshawk nest found prior to timber harvest in the Ushk Bay Project Area will be protected using the interim management recommendations for Southeast Alaska. These recommendations consist of three components:

- **Nest Area:** includes the nest, nest tree, and approximately 30 forested acres surrounding the nest tree. Habitat management guidelines recommend no vegetation manipulation within the Nest Area and no prolonged mechanical activity within 600 feet of active Nest Areas from March 15 to September 1.
- **Post-Fledging Area:** includes approximately 600 acres of contiguous forest around the Nest Area which potentially provides suitable habitat for fledglings. Timber harvest can occur within this zone, but should be planned in less important habitat types, and openings resulting from timber harvest should not be greater than 20 acres in size and 600 feet in width. No more than 5 percent of the acreage in the Post-Fledging Area may be harvested in a decade.
- **Foraging Area:** includes approximately 6,000 acres around the Nest Area that is used by adult and young goshawks to meet their food requirements. At least 20 percent of the Foraging Area should consist of old-growth forest.

Any pairs of northern goshawks not discovered prior to timber harvest may be affected if the harvest unit corresponds to goshawk nesting habitat. In addition, old-growth forest throughout the Project Area provides potential nesting habitat for future goshawk nesting activities. Therefore, the Ushk Bay Project could affect northern goshawks and potential habitat for goshawks. Assuming that all old-growth habitat in the Project Area provides potential nesting habitat for northern goshawks, the proposed action would reduce the availability of suitable habitat by 9 to 20 percent. However, this estimate does not account for the impacts of fragmentation. Goshawk populations are naturally isolated in Southeast Alaska by large expanses of water. Logging could result in additional isolation of goshawk populations by shrinking patches of suitable habitat.

Harlequin Duck

The harlequin duck will not be affected by timber harvesting activities in the Ushk Bay Project Area. The Stream and Lake Management Prescription (pages 3-180 to 3-205 of the Proposed Revised Forest Plan) prohibits timber harvest within 100 feet of river and stream channels, thereby protecting potential nesting habitat for harlequin ducks. Wintering habitat also will not be affected because no proposed activities would occur in wintering habitat areas.

Cumulative Effects

Cumulative effects result from the incremental impacts of past, present, and reasonably future actions by federal agencies or other organizations. Cumulative effects in the Project Area result from past timber harvest, the proposed actions, and timber harvest in the reasonably foreseeable future.

Old-Growth Forest

During the long-term contract, 321 acres of old-growth forest were harvested in the Project Area, all within VCU 281. No permanent roads were constructed.

The five action alternatives (B-F) propose road construction and harvesting of old-growth forest. The most acreage of old growth (3,203 acres) would be harvested under Alternative C whereas the least acreage of old growth (1,503 acres) would be harvested under Alternative D.

The Proposed Revised Forest Plan lists all timber sales scheduled for harvest. According to the schedule, no additional timber harvesting is planned for the Ushk Bay Project Area.

Cumulative effects of the past, proposed, and future timber harvest on old-growth habitat are shown in Table 4-32. Between 321 acres and 3,524 acres of old-growth forest, or between 2 and 22 percent of the old-growth forest that existed in the Project Area before initiation of the long-term contract, would be cut under the range of alternatives.

Habitat Capability for Management Indicator Species

Cumulative changes in habitat capability are shown in Table 4-33. The change in habitat capability resulting from previous timber harvest in the Project Area ranges from 2 to 5 percent for Sitka black-tailed deer, brown bear, marten, and river otter. The proposed timber harvest, in addition to the previous timber harvest, would result in the following cumulative changes in habitat capability: 9 to 16 percent for deer, 7 to 10 percent for bear, 9 to 15 percent for marten, and 18 to 26 percent for otter.

Successional Changes

The proposed action would result in conversion of a natural old-growth dominated landscape to a mosaic of old growth and early successional stages. Between 3 and 7 percent of the Project Area would be converted to the seedling/sapling successional stage under the proposed action alternatives. Less than 1 percent of the Project Area would remain in the pole/young sawtimber stage as a result of previous timber harvest. Between 29 and 33 percent of the Project Area would remain in the undisturbed old-growth stage under the proposed action alternatives.

Long-Term Productivity

Primary long-term impacts on wildlife result from loss of old-growth habitat. Sitka black-tailed deer, brown bear, marten, river otter, hairy woodpecker, and brown creeper depend on old growth and would experience decreases in long-term habitat capability, particularly during critical times of the year. Habitat capabilities for brown bear and marten would decline further if roads are left open, resulting in human-related disturbance and mortality. All Management Indicator Species are expected to be above minimum viable levels within the Ecological Province and their occurrences are anticipated to remain well distributed throughout the Project Area.

Canopy closure in second-growth stands results in reduced habitat capability for deer, marten, and brown bear. Thinning second-growth stands could delay canopy closure to offset negative impacts of post-harvest succession.

Table 4-32

Cumulative Effects of Timber Harvest and Roads on Acres of Old-Growth Habitat Through Year 2011

Alternative	Acres Cut *Pre-1992*	Projected Acres Cut *1995-1997*	Projected Acres Cut *1997-2011*	Cumulative Acres Cut Through 2011	Percent Cumulative Change of Old-Growth Habitat
A	321	0	0	321	2
B	321	1,703	0	2,024	13
C	321	3,203	0	3,524	22
D	321	1,503	0	1,824	11
E	321	2,857	0	3,178	20
F	321	1,941	0	2,262	14

Source: Artman, 1993

Table 4-33
Cumulative Change in Habitat Capability

	Sitka black-tailed deer		Brown bear		Marten		River otter		Hairy Woodpecker		Brown Creeper	
	Habitat Cap.	*% Cum. Change*	*Habitat Cap.*	*% Cum. Change*	*Habitat Cap.*	*% Cum. Change*	*Habitat Cap.*	*% Cum. Change*	*Habitat Cap.*	*% Cum. Change*	*Habitat Cap.*	*% Cum. Change*
1954	1,422	—	59	—	65	—	39	—	296	—	148	—
1992	1,385	3	58	2	63	3	37	5	276	7	89	40
Alt. A	1,385	3	58	2	63	3	37	5	276	7	89	40
Alt. B	1,281	10	55	7	58	11	32	18	250	16	80	46
Alt. C	1,205	15	53	10	55	15	29	26	228	23	73	51
Alt. D	1,289	9	55	7	59	9	32	18	253	15	81	45
Alt. E	1,195	16	53	10	55	15	29	26	233	21	74	50
Alt. F	1,267	11	54	8	58	11	30	23	247	17	80	46

Source: Artman, 1993

Biological Diversity

Species and Habitat Diversity

The diversity of plant and animal species in the Project Area would not be affected by the proposed action. All alternatives are expected to maintain viable populations of all plant and animal species in the Project Area.

Diversity of habitats in the Project Area would increase as a result of the proposed alternatives. The most recently harvested areas in the Project Area are currently in the pole/young sawtimber stage. Harvesting timber under the proposed action would create between 1,503 and 3,203 acres of seedling/sapling stage habitat. This habitat type does not currently exist in the Project Area. The newly harvested areas would provide habitat for a variety of early successional plant and animal species occurring in the Project Area.

Old-growth Habitat

The action alternatives would harvest between 1,503 and 3,203 acres of old-growth habitat. This acreage would be permanently converted from old-growth forest to successive stands of younger trees which will be harvested before they mature into old-growth forest. Between 80 and 91 percent of the old-growth in the Project Area would remain under all action alternatives. Analysis conducted for the TLMP Revision (USDA Forest Service 1991) indicates approximately 304,000 acres of old growth forest would remain distributed within the East Chichagof Island Ecological Province through the planning cycle (150 years). As the TLMP is implemented, an estimated 30 percent of the old-growth forest in the East Chichagof Island Province will be harvested.

Fragmentation of Old-growth Habitat

Habitat fragmentation is defined as the isolation of large and continuous tracts of habitat into smaller patches. Old-growth habitat in the Ushk Bay Project Area is naturally fragmented by the presence of muskegs, alpine areas, and forested areas with low productivity. Additional fragmentation of old-growth habitat will result from the proposed action alternatives.

The extent of fragmentation resulting from the proposed action is represented by the changes in acreage of old-growth forest within specific patch size classes. Table 4-34 displays the acreage in each patch size class for the existing condition in 1992 and for the proposed alternatives. Maps displaying the changes in distribution of old-growth patches are provided in Appendix L.

Most of the timber harvesting would be concentrated in patches of old-growth forest larger than 500 acres. The range of action alternatives would result in a 44 to 60 percent reduction in acreage of patches larger than 1,000 acres, with Alternative C resulting in the greatest reduction, and a 4 to 15 percent reduction in acreage of 500 to 1,000 acre patches, with Alternative E resulting in the greatest reduction. Additional reductions would result in the smaller patch size of 100 to 500 acres. Harvesting would result in increased acreage of the smallest patch sizes (0 to 25 acres and 26 to 100 acres) as small fragments of old-growth forest would be created from harvesting within the larger patches.

Population Viability

Wildlife habitat must be managed to maintain viable populations of existing native and desired non-native vertebrate species across the national forests. For planning purposes, a viable population is one that has the estimated numbers and distribution of reproductive individuals needed to ensure its continued existence, and is well distributed throughout the existing range of the species. In order to maximize the probability that viable populations will be maintained over time, habitat must be provided to support at least a minimum number of reproductive individuals and that habitat must be well distributed and connected so that those individuals can interact with others. The National Forest Management Act does not require individual project areas to independently maintain viable populations but the Ushk bay Project Area should contribute to and not cause a decline of overall viable populations for the East Chichagof Island Ecological Province (USDA Forest Service 1991). However, the Ushk Bay Project Area is critical in maintaining well-distributed populations by providing connectivity between surrounding habitat areas.

Recent efforts to refine the process of population viability management led to the convening of the Interagency Viable Population Committee. This Committee focused on viability risk assessments that could be applied to the evaluation of planning alternatives Forest-wide. The Committee's recommendations are still in draft form and have recently undergone a peer review under the direction of the Pacicfic Northwest Research Station (Kiester and Eckhardt 1994). The peer review resulted in several recommendations on alternatives and refinements to the Committee's strategy. The recommendations in the peer review are being considered for application in revision of the TLMP, however, the Committee's strategy is still the latest approach to maintaining viable populations. The Committee recommended Habitat Conservation Areas

Table 4-34.

Patch Size Acreage

Alternative	Patch Size (Acres) 0 - 25	26 - 100	101 - 500	501 - 1,000	1,000+
A[1]	1,283	2,896	4,822	4,123	3,495
B	1,270	3,113	4,828	3,962	1,946
C	1,303	3,331	4,243	3,562	1,406
D	1,263	3,056	4,866	4,009	2,095
E	1,313	3,280	4,238	3,497	1,760
F	1,291	3,086	4,613	3,968	1,946

1 Alternative A is the No-action Alternative and represents the existing condition for the Project Area.

Source: Artman, 1993.

(HCAs) of three sizes: large, medium, and small (Suring et al. 1993). The objective of the HCAs is to provide sufficient habitat for wildlife species which require large tracts of old-growth forest. Criteria for the HCAs are as follows:

- **Large HCA:** encompasses 40,000 acres with at least 20,000 acres of Volume Class 4 (VC4) forest and at least 10,000 acres of Volume Class 5, 6, or 7 (VC5+) forest. Large HCAs should be no more than 20 miles apart to ensure that dispersal effectively occurs between them.
- **Medium HCA:** encompasses 10,000 acres with at least 5,000 acres of VC4 forest and at least 2,500 acres of VC5+ forest. Medium HCAs should be located no more than 8 miles apart to ensure effective dispersal between them.
- **Small HCA:** encompasses 1,600 acres with at least 800 acres of VC4 forest and at least 400 acres of VC5+ forest. One small HCA should be maintained within each VCU greater than 10,000 acres.

The Population Viability Committee mapped one possible layout of large and medium HCAs for the Tongass National Forest (Suring et al. 1993). None of the HCAs overlap with the Ushk Bay Project Area. One medium HCA (#136) is located west of the Project Area in the West Chichagof-Yakobi wilderness area, as shown in Figure 4-1. This HCA would not be impacted by the proposed action in the Ushk Bay Project Area.

Small HCAs were not mapped by the Population Viability Committee. Mapping small HCAs requires more site-specific knowledge and is intended to be completed at the planning level of individual projects. According to the criteria, at least one small HCA should be established in each VCU greater than 10,000 acres. In the Ushk Bay Project Area, this includes VCUs 280 and 281. Lands not suitable for timber harvest, existing buffers, and other lands removed from timber harvest should be used to the extent practicable for small HCAs.

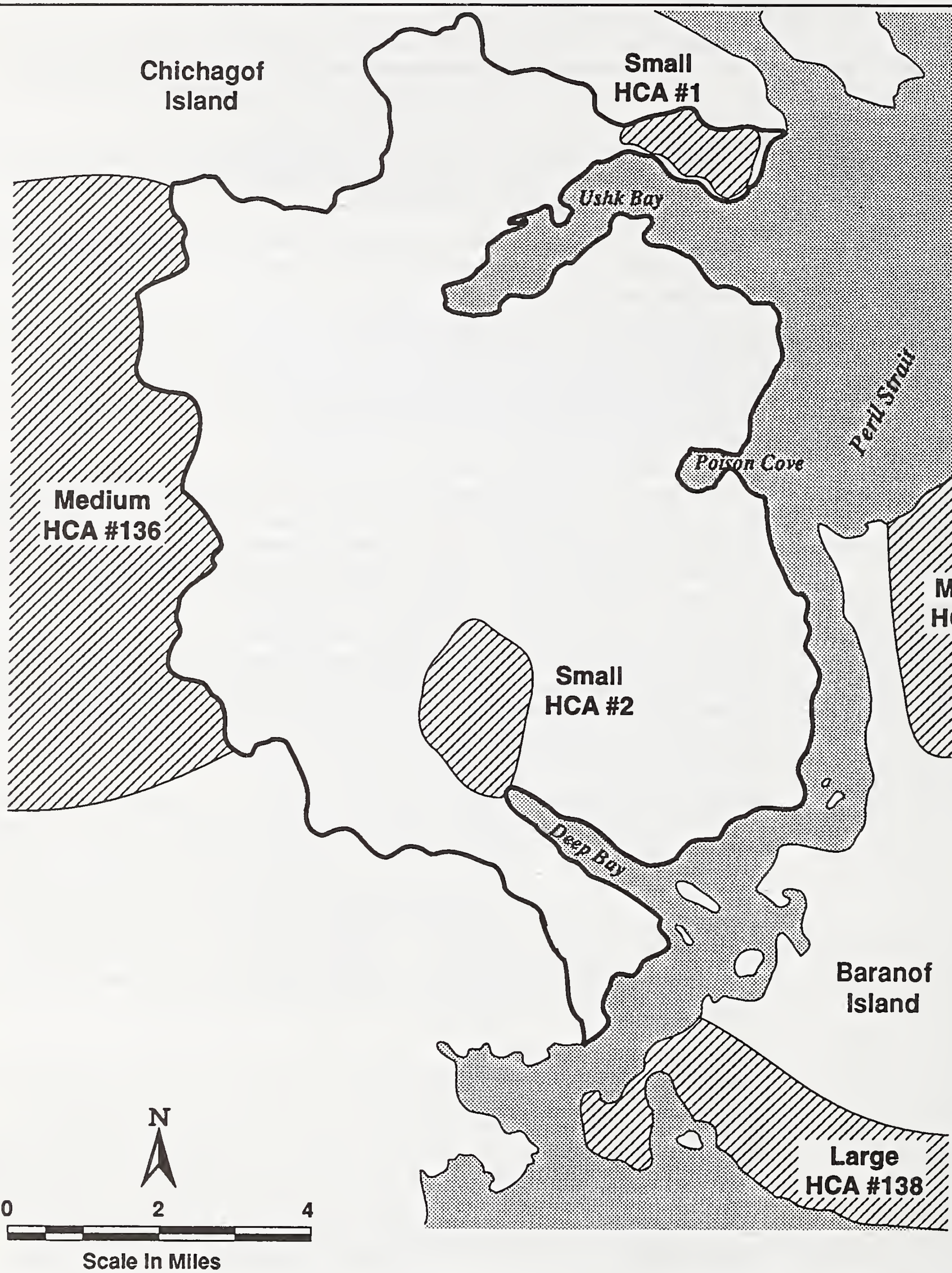
Two small HCAs for the Ushk Bay Project Area, to meet the above-defined criteria, are shown in Figure 4-1. HCA #1 is in VCU 281 along the north shoreline of Ushk Bay. This HCA provides moderately high quality habitat for Sitka black-tailed deer and marten. HCA #1 would be maintained under Alternatives A, B, and F. HCA #2 is in VCU 280 along Deep Creek. This HCA provides very high quality habitat for brown bear, marten, and river otter. HCA #2 would be maintained under Alternatives A and B.

In addition to the HCAs, the Population Viability Committee recommends that corridors of old-growth forest habitat be established to increase the likelihood of dispersal of species of concern throughout the landscape (Suring et al. 1993). Corridors in the Ushk Bay Project Area include the 500-foot beach fringe, the 1,000-foot estuary fringes, and the 100-foot buffers along Class I and II streams. Roads would be constructed through beach and estuary fringe and through riparian buffers under all action alternatives. Alternative E proposes to harvest timber in some portions of the beach fringe along the north shoreline of Ushk Bay. Overall, Alternative E would impact the most acreage of the beach fringe, estuary fringe, and riparian habitat, and Alternative B would impact the least acreage (see Tables 4-18, 4-19, and 4-20).

Comparison of Alternatives

Based on old-growth habitat and patch size acreage, Alternative A would do the most to preserve the natural biological diversity of the Project Area and maintain natural ecosystem processes. Of the action alternatives, Alternative D would maintain the most acreage in large high volume old-growth patches (greater than 500 acres). Alternatives C and E would impact the most acreage of old-growth forest and would result in greater fragmentation than the other alternatives. Alternative B best meets the recommendations of the Population Viability Committee by maintaining two small Habitat Conservation Areas, including one in the Deep Bay drainage. Corridors of old growth habitat along streams and the shoreline would be maintained under all alternatives.

Figure 4-1
Habitat Conservation Areas



Source: Artman 1993

Fish and Watershed

This section summarizes the types of effects that timber harvesting and road building may have on freshwater resources in the Ushk Bay Project Area. The analysis addresses potential changes in sediment production, water quality, streamflow and effects on aquatic (fisheries) habitat. Also presented is a relative comparison of the expected magnitude of effects and impacts between alternatives, and a comparison of the relative magnitudes of expected impacts which could be observed within the area during and after the harvest. Pertinent literature is summarized concerning potential effects that can occur as a result of timber harvest practices in environments similar to the sale area.

Streams in the Ushk Bay Project Area were field surveyed by Dames & Moore hydrologists, geologists, and fishery biologists in the summer of 1992 to confirm existing stream information, and document and classify unmapped streams near potentially impacted areas. The surveys were based on guidelines and procedures provided by the Forest Service Aquatic Habitat Management Handbook (USDA Forest Service 1991e), Channel Type User Guide, Tongass National Forest, Southeast Alaska, Draft (USDA Forest Service 1992), and the Fisheries Surveys Handbook, Region 10 (USDA Forest Service 1981).

Watersheds are the primary management unit for water resources. Each watershed is a contiguous system, with cumulative impacts to water resources and aquatic habitat from watershed disturbances accruing progressively in a downstream direction. Although disturbances in the lower basin have less impact because slopes are typically less steep, they can directly affect important aquatic habitat (Class I and II streams) that occur more frequently in lower basins. In addition, lower basin disturbances are compounded by cumulative impacts from upstream effects.

General Effects

Impacts from a disturbance in a particular watershed are a function of their position in the watershed, the potential magnitude or degree of the disturbance, initial conditions or sensitivity of the watershed to the disturbance, and the proximity and importance of aquatic resources. Timber harvest disturbances result from vegetation removal, road construction, and specific logging practices. The following impacts may be caused by timber harvesting in watersheds, although Best Management Practices (BMPs) can minimize or eliminate the impact:

- Potential increase in mass movement of soils and landslides from harvested slopes.
- Potential increased bedload and suspended sediment contribution to streams resulting from mass movement of soils and landslides.
- Potential changes in the amount of organic debris entering streams, including large woody debris from removing stream buffers or from blowdown.
- Potential changes to water temperature and dissolved oxygen in streams.
- Potential increases in water yield from watersheds, resulting in increased baseflows in streams.
- Potential changes in habitat diversity or quality due to the mechanisms described above.
- Potential changes in accessibility or loss of habitats in streams.

The primary water resource concerns in the Ushk Bay Project Area are the potential impacts to fish habitat resulting from increased bedload sediment contribution to streams. However, because of the high degree of natural mass wasting, these impacts may be obscured because stream systems are already over-supplied with sediment (Paustian 1987; MacDonald and Ritland 1989).

Direct and Indirect Effects

Effects on Water Yield and Streamflow

Removal of vegetation and compaction of surfaces from road construction and use of heavy equipment will affect the overall water balance in a watershed. Typically, the removal of vegetation causes increased soil moisture and water yield from basins due to several factors, including: reduced evapotranspiration, reduced interception of precipitation and subsequent evaporation from the tree canopy, increased infiltration because more moisture reaches the ground, and changes in runoff rates from rainfall and snowmelt.

Water yield increases are roughly proportional to the percentage of the watershed that is harvested (Rothacher 1970); however peak flows may not increase directly with the area of disturbance. Road construction generally does not increase water yield, although it does affect timing and magnitude of peak flows.

Although water yield from watersheds may increase proportionally to the amount of harvesting (or disturbance), annual and peak floods tend to increase exponentially in relation to the amount of disturbance (MacDonald and Ritland 1989). In watersheds with a low percentage of disturbed area (less than 30 percent), increases in peak flow over pre-harvest conditions are less significant, often less than 10 percent (Harr et al. 1975). In watersheds with high percentages of disturbance (greater than 85 percent), however, peak flows can increase dramatically (more than 50 percent) during the winter wet season, and more than 100 percent during the dry season. In addition, large flood events with greater return periods (i.e., the 25-year-event or more) tend to be less affected by harvesting (Harr et al. 1975). When annual peak flows are increased by less than 20 percent, the impact on sediment transport is not likely to be significantly increased, particularly in rainfall-runoff-dominated watersheds (MacDonald and Ritland 1989).

In watersheds where snowmelt contributes significantly to peak flows, such as in the Ushk Bay Project Area, harvesting is more likely to cause larger floods (MacDonald and Ritland 1989). In clearcut areas, snow accumulates to greater depths due to less interception by the canopy, and heat is more efficiently supplied to the snow during melt because of the loss of insulation by the canopy. In Southeast Alaska, heat transfer is accomplished primarily by warm rain falling on the snow, rather than direct solar radiation. There have been few studies in Southeast Alaska; however, one study (Meehan et al. 1969) showed no changes in the stream-flow regime after clearcutting 25 percent of a basin, while another study (Bartos 1989) found significant increases in low flows after a 35 percent clearcut in the Staney Creek watershed.

In high-gradient watersheds with significant naturally occurring mass wasting, such as in the Ushk Bay Project Area, increases in peak flows due to harvesting rarely cause increased channel degradation (higher channel erosion and sediment transport). This is because factors such as bed armoring, presence of excess large sediment and numerous steps formed by logs and boulders prevent velocities from exceeding threshold values for transporting more and larger material (Satterlund and Adams 1992). Consequently, the largest potential impacts of increased peak flows on channel erosion, sediment transport, and sedimentation characteristics seldom occur. Because of this, the relatively low percentage of proposed harvest and application of BMPs to road construction and timber harvesting, potential increases in peak flows due to the harvesting is considered to have insignificant impacts to stream channel conditions. As a result, the impact of peak flows on fish and fish habitat is expected to be relatively small and insignificant from any of the alternatives.

Effects on Floodplains

The numerous streams in the Ushk Bay Project Area make it impossible to avoid all floodplains during timber harvest activities. Environmental consequences to floodplains from all alternatives are generally limited to effects from road construction. The small area of floodplains proposed for actual timber harvest would not affect flooding or erosion.

Road construction can cause both direct and indirect impacts on floodplains. It may have no detectable influence, or it may alter flows in minor streams because of routing by roadside ditches and culverts. Channel and flow alteration can locally affect the velocity of flows, width and depth of water, and the location of flow, causing erosion and sediment transport characteristics.

BMPs (USDA Forest Service Handbook 2509.22) are used to minimize impacts on floodplains as well as to protect roads and drainage structures. Examples include designing bridges and culverts to handle expected flows, and installing frequent cross drains or ditch relief culverts to minimize erosion from large water concentrations moving overland or entering natural drainages.

Logging activities are controlled to minimize damage to stream banks and bottoms from yarding, the process of conveying logs to a landing. Large woody debris is generally left in streams if it contributes to stream stability and moderation of flow energy and velocity. However, if it could move or block flow upstream of bridges or culverts, it might be removed to ensure the passage of high flows without causing diversions and erosion.

None of the proposed alternatives would result in human occupancy of floodplains. Because the project proposes no floodplain development other than stream crossings, it would not adversely affect property values or human health, safety, or welfare.

Because of the limited changes expected in floodplains as well as the naturally high amounts of precipitation and runoff conditions, the risk characteristics related to flooding would not change to a significant degree as a result of activities performed under any of the alternatives. In general, road location, construction measures, and drainage structures will have negligible effects on the natural and beneficial uses of floodplains in the Ushk Bay Project Area from any of the alternatives.

Effects of Erosion and Sedimentation

Increased erosion and sedimentation are typically the greatest impacts of timber harvests on water resources (MacDonald and Ritland 1989; Satterlund and Adams 1992). Increased erosion is represented by mass wasting, bank failure, channel erosion, washouts at stream crossings, and slope erosion from clearcut areas and roads and ditches.

The most significant erosion processes in Southeast Alaska and the Pacific Northwest occur from mass wasting and road washouts (Swanston 1969; MacDonald and Ritland 1989), although slope erosion can be significant depending on the type of harvest practice used. Eroded material may be stored on slopes or be transported to streams. Once in a stream system, sediment generated from slopes or roads can migrate further downstream or be deposited in the stream channel.

After the basic necessity of adequate water supply is met, the primary requirement for quality fish habitat is freedom from excessive sediment and turbidity (Everest 1987) and retention of desirable channel morphology and stability (Bisson et al. 1987; Sullivan et al. 1987).

High levels of sediment can reduce light penetration and inhibit primary production, abrade and clog fish gills, prevent feeding by sight feeders, interfere with migration, and cause fish to avoid turbid reaches. Fine sediment deposits may seal rubble and gravel substrates, decreasing spawning area, egg survival, emergence of fry, and hiding cover for fingerlings (Satterlund and Adams 1992). Pool volumes may be decreased, resulting in direct loss of living space (Reiser and Bjornn 1979; Toews and Brownlee 1981). The following sub-sections provide details on the physical processes and potential effects of erosion and sedimentation on aquatic habitat in the Project Area.

Physical Processes

Mass wasting is a function of soil type and slope steepness, as well as the underlying geology and root strength of soils, and is often associated with V-notch drainage features (Bjerklie and

Stroud 1992; Swanston 1969). It can be triggered by high winds that blow down and uproot trees, exacerbating surface erosion by exposing loose soil.

In the Project Area, natural soil creep with possible mass wasting is evident in high-risk areas where slopes are greater than 65 percent (Bjerklie and Stroud 1992). Increased soil moisture and reduced root strength from tree removals potentially increase the frequency of mass wasting events in these areas. Road construction in high soil-hazard areas can also exacerbate mass wasting due to increased loading and concentration of runoff.

The frequency of mass wasting could significantly increase from road construction in Class 4 soil-hazard areas in the Project Area. Relative risk is reduced for Class 3 hazard areas and very little risk of increased mass wasting is associated with Class 1 or 2 areas. Harvesting is not planned in Class 4 areas, but will occur in Class 1-3 areas under all alternatives. In the few places where proposed roads traverse a Class 4 soil hazard, removed materials will be trucked out rather than side cast to minimize road material available for potential transport.

Recent studies in Southeast Alaska (Swanston 1989) have indicated that landslides from harvested lands may increase as much as 3.5 times. In the Project Area, increased landslides would likely be the major contributor to higher sediment yield from harvested slopes. Most of the eroded material from landslides is stored on slopes, with the remainder entering steep V-notch channels for a period of time before reaching fish-bearing stream channels and valley bottoms (Swanston and Marion 1991). The storage effect diminishes the impact of the overall increase in mass movement. In general, large mass wasted material does not completely move out of the steep V-notch channels for at least ten years after harvesting (MacDonald and Ritland 1989); however, suspended material will be flushed out much more quickly.

Most material eroded from slopes consists of fine-grained suspended sediments (Satterlund and Adams 1992). Incorporating BMPs can significantly reduce slope erosion for any of the harvest practices employed; however, some material will likely be eroded even using the best practices. Studies conducted in coniferous forests have shown that clearcutting can disturb between 5 and 25 percent of the ground depending on the practice employed. In general, however, the quantity of eroded material caused by harvesting is small compared with potential erosion from mass wasting (MacDonald and Ritland 1989).

Potential surface erosion associated with harvest practices can be ranked according to the expected degree of disturbance, with helicopter logging causing the least disturbance, followed by skyline, shovel, and highlead methods. Helicopter logging removes logs by air, causing very little on-the-ground disturbance, while highlead logging drags logs on the ground to the transportation point, causing significant disturbance of the ground surface. Skyline logging suspends or partly suspends logs being carried to the transportation point, while shovel logging uses ground vehicles to move logs to the transportation point.

Erosion from roads is often the most significant contributor of sediments to streams. Increased stream sediment yields attributable to roads can vary between 5 and 20 percent above background, consisting predominately of suspended materials. In addition, road washouts and failures can contribute even greater amounts of sediment to streams. Applying BMPs can reduce these impacts by more than 40 percent (MacDonald and Ritland 1989).

Washouts are the most important contributor to sediment erosion from roads. The most likely places for washouts are at stream crossings. When a road washout occurs at a stream crossing, water and sediment dammed behind the road at the crossing can cause significant downstream damage, including channel erosion, and carry with it sediment that was stored behind the road as well as the road materials themselves. Washouts adjacent to stream crossings are not common when culverts are adequately sized and properly constructed. BMPs are designed to minimize these problems. Sediment generated on the road surface and in roadside ditches is generally not a major contributor of sediment unless road drainage characteristics are poor (MacDonald and Ritland 1989).

The proposed Ushk Bay harvest will employ BMPs in the design of roads and stream crossings to minimize erosion due to road washouts or poor drainage. Many roads are temporary and will be abandoned or removed after the harvest, along with all drainage structures. These measures will reduce the long-term potential for road washouts and erosion of road materials. For roads that are left open permanently, a program of regular maintenance will be implemented. In addition, bridges are proposed for all stream crossings where significant accumulation of debris was noted during field surveys, including most Class I and Class II stream crossings. The bridges will minimize flow restriction and fish passage problems in channels sensitive to washouts due to clogging. These factors have been incorporated into the impact analysis for each watershed and VCU (see Appendix D).

Although increased channel erosion may occur in some reaches, this type of erosion generally reworks sediments already in the stream system, unless stream banks are disturbed by treefalls or other phenomena. Applying BMPs to reduce impacts to stream banks, including log suspension requirements, split yarding on streams, and buffers on Class I and II streams, will likely prevent channel erosion from becoming a significant contributor to sediment increases in streams.

In the steep V-notch channels that characterize Southeast Alaskan mountain watersheds, much of the sediment generated over time by mass wasting on upper slopes is stored in channels behind obstructions such as boulders and large woody debris (MacDonald and Ritland 1989). If these debris dams fail or are blown out by large floods, resulting debris flows blow out downstream dams and eventually deposit the debris in the mainstem channels. In order to minimize this potential, BMPs are applied during harvesting to reduce actions that might de-stabilize these channels and undermine existing debris dams. An example would be to leave existing debris in channels, but limit the addition of new debris and minimize bank disturbance.

Stream systems in the Project Area contain relatively few fine sediments. The most extensive deposition of fine-grained sediments, generally fine to coarse sands mixed with cobble and gravel, was observed in the lower reaches of the Deep Bay drainage. This drainage is the longest in the Project Area, and suggests that fine grained material is transported so readily that most of it is carried out of the stream systems to the marine environment. In addition, due to the shallow soils in the area, major sources of fine sediments are not present. Fine-grained sediments were noted originating from uprooted trees and landslides. Coarser sediments were observed accumulating behind channel obstructions, including large woody debris and boulders, as well as in pools.

The lack of fines indicates that there are few sources of fines in watersheds in the Project Area. This observation was corroborated during field surveys, during which few sources of fines were noted because of poor soil development in much of the area. Fines that are generated from tree falls or colluvium slides are quickly flushed out of the system because of high-gradient streams in the Project Area, limiting accumulation of fines in stream channels. Road construction and soil disturbance on slopes will likely increase somewhat the number of fines available for potential erosion and transport to streams after harvesting; however, because of the paucity of fines in the watersheds combined with the high flushing rate this will not be a significant concern.

The stream systems in most Project Area watersheds are subject to naturally occurring high levels of sediment supply (Bjerklie and Stroud 1992), which has caused clogged channels and aggraded stream beds in many areas. As mentioned above, sediments that remain in the stream systems are larger in size (greater than six to eight millimeters in diameter). During low flows in clogged stream channels, flow often becomes subsurface within the interstices of the sand, gravel, and cobble that fill the stream channel. In addition, if channels become clogged, the flow may jump the channels and cause additional erosion by carving new channels adjacent to the old ones.

The primary input of sediment to streams in the Project Area is from mass wasting events. Af-

ter harvest, increased mass wasting is likely to continue to be the most important contributor of sediment in streams, although roads are also likely to impact sediment loading in streams. Increases in suspended material and turbidity may occur during storm events or immediately after a landslide; however, because of the paucity of fines and steep stream gradients and subsequent high stream velocities, these increases will likely be very short-term (on the order of hours), and are not expected to significantly affect stream channel conditions. On the other hand, bedload from mass wasting events and road washouts will remain in stream channels and affect geomorphologic and hydrologic conditions.

Potential increases in mass wasting events from harvested slopes may increase bedload in streams. However, due to the low percent of harvest in the watersheds for all alternatives, the sediment storage capacity within watersheds will minimize the direct impact to streams to a low level.

Aquatic Habitat

A literature review led to the conclusion that the greatest adverse impacts of siltation on fish is on incubating embryos and larval fish. Increased turbidity from smaller sediment particles generally reduces visibility and decreases the ability of sight-feeding fish to obtain food (Berg and Northcoat 1985), thus reducing feeding habitat. Siltation without cleansing and scouring flows can result in permanent rearing and spawning habitat changes (Platts et al. 1989).

The lower reaches of Deep Bay—one of the more important salmon spawning and production areas—appear to retain some fine sediment in the stream system, and probably the greatest concentrations in the area. Since there appeared to be only small amounts of fine sediment retained in Project Area streams overall, and salmonids have several adaptive behavioral mechanisms that allow them to cope with substantial spatial and temporal variability in stream sediments (Everest 1987), it is expected that fine sediments will not have a significant impact on salmon habitat.

Channel aggradation from larger-sized sediment can cause intermittent summer flow and reduce summer rearing habitat (Cederholm and Reid 1987). In winter, bedload movement accompanying high flows may bury eggs deep under the streambed and prevent escape of fry and embryos may be crushed as they are scoured out of their redds (Reiser and Bjornn 1979). Juvenile salmonids that overwinter in the Project Area (i.e., coho and Dolly Varden) prefer pools with cover; since anadromous salmonids often reside in Alaskan streams at least one year longer than in more southerly streams, winter habitat is especially important. The amount of pool habitat with cover could therefore limit winter survival and smolt production (Heifetz et al. 1986).

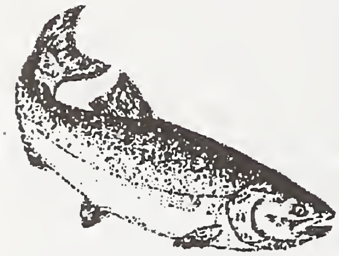
As described above, sediment deposits in the Project Area have observably aggraded some channels under natural conditions. This process will probably increase to some degree with further disturbance. Because of rapid rising and falling flow rates occurring in Project Area streams, fish can be stranded in reaches during higher flows, reducing the availability of habitat and migration routes during low flow periods. Swanston (1989) suggests that three percent of natural and management-induced mass wasting may directly affect fish streams at any given time.

Project Area channels that are most affected by excess sediment are generally just downstream of a steep slope and at the transition of a Class II and Class III stream. The direct impact to fish habitat appears minimal from any of the alternatives. Roads will be constructed using BMPs which will greatly reduce the potential impact for washout or passage problems. All fish streams will have bridges or culverts designed to allow fish passage and to accomodate expected bedload sediments and floating debris.

The major functions of large woody debris in creating aquatic habitat are to provide shelter from high winter flow, habitat space for invertebrate production and fish food in streams, and storage of sediment for spawning and rearing (Bisson et al. 1987). Channel obstructions such as large woody debris creates hydraulic diversity and enhances species diversity by providing habitat for a variety of species and age groups (Sullivan et al. 1987). The amount of preferred winter habitat depends largely on the amount of large organic debris that is available. In a study by Heifetz (1986), clearcut reaches had less large organic debris and less pool area than buffer strips which maintained pool area and, in some cases, the amount of cover increased by large woody debris from blowdown. They concluded that in logged areas, buffer strips along stream banks protect preferred winter habitat by maintaining and providing future sources of large organic debris (Heifetz et al. 1986). Since all Class I and II streams would receive a minimum 100-foot or wind-firm buffer in the Project Area, large woody debris should continue to have an equally important role in the diversity and stability of aquatic habitat. If windthrow did cause the loss of the buffer, there would be an immediate heavy input of large woody debris. This would be followed by many years of limited input along that stream section.

Water quality studies conducted in Southeast Alaska indicate that BMPs are effective at minimizing impacts and maintaining sediment concentrations within Alaska standards (Paustian 1987), except for short-term localized effects. In addition to impacts of sediment on water qual-

Natural landslides often shift streambeds.



ity, increased organic material enters streams from slash (branches, leaves, etc.) as well as from eroded organic soils. The increased organic loads are often reflected by increases in biological oxygen demand (BOD) as well as large woody debris. Eroded soils can also introduce changes in nutrient loadings to streams, and reduced vegetative cover and geomorphic changes in streams can affect water temperatures. Dissolved oxygen levels can be affected by changes in BOD, temperature, and geomorphology of stream channels.

Because of the preponderance of cloudy days in the Project Area, radiational heating and cooling from removal of insulating vegetation is not as pronounced as other areas of the Pacific Northwest, including Alaska's interior, which has many more cloudless days. In addition, the potential effect of removing riparian trees will be reduced by maintaining a buffer strip along Class I and II streams. A 50- to 80-foot-wide streamside leave strip has proven to be effective in attenuating solar radiation and reducing stream temperature increases (Brown et al. 1971). Impacts to Class III tributaries should not result in notable impacts to Class I and II streams. Most Class III streams only have significant flow during precipitation events, during which flows rise and fall rapidly with relatively short residence times when warming could occur (few lakes and ponds and steep gradients), even during low flows. Solar radiation is also not as great during these periods because of cloud cover.

Murphy et al. (1981) found that small open clearcut sections of streams exhibit greater density and biomass of invertebrates and cutthroat trout than shaded forested sites. The narrow width of shoreline vegetation that would be removed for construction of road crossings on Class I and II streams would create insignificant temperature increases and may increase production because the added sunlight may allow increased primary productivity.

Increased BOD can affect dissolved oxygen levels. However, because of the high-energy streams that characterize the area, residence times in streams is relatively short and organic materials have little opportunity to break down and affect BOD and oxygen levels. Thus, increased BOD should not have major impacts on Project Area streams.

In reaches where streams are filled by bedload, pools may be isolated, and flow significantly slowed, potentially becoming subsurface intergravel flow during low-flow periods. Under these circumstances, re-aeration will be diminished, and if respiration by aquatic organisms or BOD creates oxygen demand, oxygen can be depleted and occur at water temperatures well below lethal levels for fish.

There are reports of pre-spawner mortality in the Deep Bay region (Reub and White 1992). Pentec (1991) identified several basin characteristics (e.g., elevation, hydrologic buffering capacity, and muskegs) associated with historic pre-spawning fish kills. These characteristics may relate to the susceptibility of streams to extreme low flows or dewatering during dry periods. Pentec found that stream discharge and spawner abundance were the primary factors controlling dissolved oxygen levels during the spawner migration period in several Southeast Alaska study streams. Murphy (1985) studied a fish kill on Etolin Island and concluded that salmon in the intertidal reach of Porcupine Creek died from suffocation and stranding in shallow water, not from high temperature stress. The potential problem in Deep Bay is probably similar to these reported cases and could be affected by channel aggradation from the timber harvest. If removal of thermal buffers along upstream Class III channels and potential blowdown along the main channel does result in temperature change, that might exacerbate the problem. However, increased summer low flows expected to result from the timber harvest should at least partially offset these impacts.

Comparison of Alternatives

The primary physical impact on water resources expected from the proposed harvest is increased bedload delivery to streams from increased mass wasting and potential road washouts and failures. Although increases in suspended sediment and turbidity are likely, these effects are expected to be short-lived with no lasting impact because of high streamflow velocities that flush fine-grained sediments out of the system. Potential impacts on water quality may also occur; however, these impacts, which are often associated with high bedload, are expected to be minor. These conclusions apply to all alternatives.

Peak streamflows were assumed to increase significantly only in watersheds with greater than 25 percent disturbance (harvest area plus roaded area). Based on this assumption, peak flows would be expected to increase only in watersheds O83A and O29A under Alternative C. These watersheds are both coastal watersheds draining directly into Peril Strait through Class III streams. Increased flow in these watersheds will not directly affect fish-bearing streams.

The types of effects and the expected magnitude and extent of these effects as related to specific processes and environmental concerns (such as water quality, quantity and habitat quality) have been evaluated and discussed above. In general, the effects are expected to be minor for all the alternatives relative to the natural processes that continually shape the character of the environment in the Ushk Bay Project Area.

A detailed comparison of impacts between alternatives is provided in Appendix D, Tables D-1 through D-6. The summary of the relative disturbance and impact ratings is presented in Figure 4-2.

The impact rating for each alternative is an index to the total magnitude of impacts that are expected to occur for each alternative. Figure 4-2 shows that, in general, the expected magnitude of impacts is directly related to the amount of disturbance. Although the overall impacts are expected to be minor, the magnitude and extent of those impacts as an aggregate will vary directly with the amount of disturbance and quantity of timber harvested.

Other Potential Effects

The Project Area is presently a popular recreation site. Recreational fishing in both marine and freshwater is expected to increase with the addition of a logging camp and increased access by proposed road systems. During road construction and timber harvesting, the fishing pressure would be greatest and focus on fish streams near work camps.

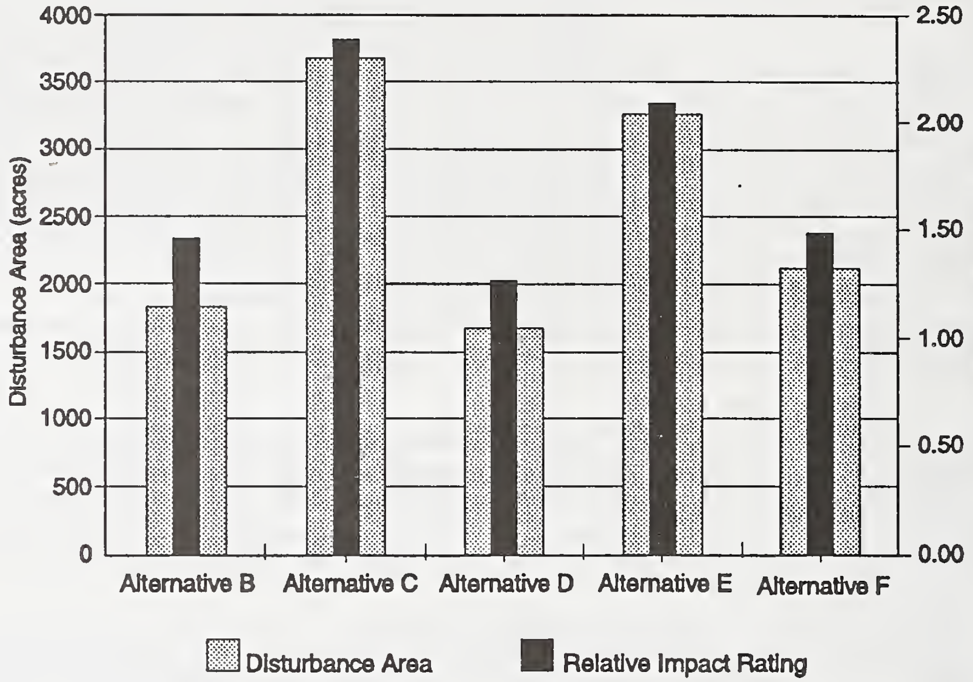
In addition, petroleum products could enter the water from spills when equipment refueling occurs on floodplains. Chronic or large spills into waterbodies during road construction or timber harvest could affect the biota, either causing mortalities or causing fish and their food organisms to avoid contaminated areas (Maynard and Weber 1981, Weber et al. 1981). Aromatics in diesel and gasoline are particularly toxic until evaporated. Heavier oils can coat streambeds and interfere with production of food organisms consumed by fish (Kolpec et al. 1973). Spills into smaller tributaries could affect resident populations, especially when incubating embryos are present. Spill prevention and containment control plans are required and are generally effective in preventing or minimizing spill impacts.

During camp operation, employees will need to use fresh water and dispose of wastes. As discussed above, the amount and quality of stream water are important factors in determining the amount and quality of aquatic habitat. These effects can be mitigated through permit stipulations.

Cumulative Effects

There are little, if any existing impacts from previous logging activities in the Ushk Bay Project Area, although a small amount of harvesting has taken place in the past. Any impacts associated with the proposed harvest, therefore will be independent of human activities other than the harvest operation itself. However, since natural conditions are characterized by relatively high rates of mass wasting, erosion, and bedload deposition in stream channels, potential impacts from harvesting will be cumulative to existing natural impacts to water resources. In watersheds with high natural (background) erosion rates, cumulative impacts from timber harvesting are often difficult to discern (MacDonald and Ritland 1989). There could also be cumulative impacts to fisheries from the combination of increased sedimentation and increased fishing pressure.

Figure 4-2
Disturbance Area and Relative Impact Rating Comparison for Each Alternative



Source: Bjerklie and Reub 1993

The cumulative effects of the proposed harvest and roading for each alternative has been analyzed by watershed and VCU. The methodology for the analysis is presented in Appendix D. It includes assessment of the potential impacts associated with each harvest unit, road, and stream crossing. No long-term cumulative impacts are likely to result from any of the alternatives. The recovery rate of a watershed between harvests depends on watershed sensitivity and degree of impact. Recovery may take as long as 16 to 30 years before impacts from the harvest are no longer apparent (Rothacher 1970). None of the alternatives would have further harvest within this time.

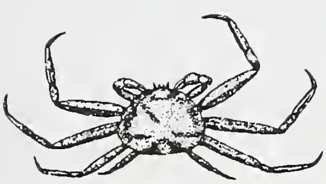
Marine

Six sites for the possible construction of LTFs have been proposed within the Ushk Bay Project Area. The maximum number of LTFs that would be constructed under any single alternative is four (Table 4-35). The largest volume of timber projected to be transported through any single LTF in the Project Area (67 MMBF, Ushk Bay, Alternative E, Table 4-36) is well below the volume of timber transported at any LTF where a significant impact has been recorded (Pease 1974). Three sites on the north shore of Ushk Bay were analyzed for the 1986-90 operating period (Hughes, et al 1986; USDA Forest Service 1986). That analysis considered barge LTFs as well as rafting facilities and is incorporated by reference.

Direct Effects

The most severe direct impact of an LTF on the marine environment is the actual construction of the facility and that varies by type of LTF and differences in topography. Table 4-37 lists each proposed LTF and the type of facility recommended for that location. Both intertidal habitat and subtidal habitat may be buried during construction of an LTF. The construction of a low-angle slide or drive-down ramp requires the placement of fill material throughout the intertidal to the level of the low-tide water line. Since these types of LTF are generally constructed in areas with gently sloping beaches, a varying amount of intertidal habitat (depending upon the extent of the intertidal) would be completely covered by this construction. A-frame bulkhead LTFs are generally constructed in areas where the slope of the intertidal and shallow subtidal is greater than that of beaches where low-angle slide or ramp type LTFs are constructed. This type of LTF requires a minimum of 5 feet of water at the bulkhead during low tide. Therefore depending upon the slope of the beach a small portion of the subtidal would be directly affected by construction of this type of LTF. Table 4-38 lists the amount of intertidal and subtidal marine habitat expected to be buried by the construction of each LTF.

The Alaska Timber Task Force (ATTF) has identified ten factors that determine the suitability of a particular location for construction of an LTF (see Appendix E). The ATTF siting guidelines cover all aspects of LTF construction, including safe operation, economic viability, and biological and environmental resource protection. Of the six sites examined for LTFs in the Project Area, four meet the ATTF siting guidelines. The north Ushk Bay site may fail to meet the criterion for proximity to sensitive habitat, in that the area appears to be a nursery for the commercially valuable California sea cucumber. Hydrological factors that contribute to the formation of such a nursery are thought to include the existence of localized eddies or gyres that entrain the planktonic larvae of the sea cucumber into a localized area until they are ready to settle to the bottom and take up the adult lifestyle (Cameron and Fankboner 1989). This area then would supply surrounding areas with sea cucumbers and perhaps other invertebrates. If this is happening at the north Ushk Bay LTF site, bark accumulation from log transfer operations at the LTF may be greater than acceptable. The Deep Bay site does not meet the guidelines because there is insufficient water exchange to ameliorate potential bark accumulation due to log transport activities.



Accumulation of woody debris (primarily bark) in the marine environment appears to be the single most important factor in limiting the construction and operation of LTFs. Existing data suggests that large-scale bark accumulation may impact benthic abundance without affecting diversity. Generally, infaunal organisms are negatively affected while sessile epibenthic organisms increase in abundance with the increase in attachment area. Additionally, abnormal reproductive condition in Dungeness crabs has been at least partially attributed to the presence of woody debris within the environment. Barge type LTFs minimize or eliminate woody debris accumulation.

Table 4-35

Proposed LTF Locations

Alternative	South Ushk Bay	North Ushk Bay	North Poison Cove	South Poison Cove	Goal Creek	Deep Bay	Total
A							0
B	X			X			2
C	X		X		X	X	4
D	X		X			X	3
E		X		X	X		3
F				X			1

Source: Cameron, 1993

Table 4-36

Volume of Timber (in Millions of Board Feet) to be Transported Through Each LTF and Estimated Life Span of Each LTF

LTF Site	Alternative B	C	D	E	F	Estimated Number of Years LTF Active
North Ushk Bay	—	—	—	62.4	—	3
South Ushk Bay	29.2	46.7	23.4	—	—	3
North Poison Cove	—	25.5	17.1	—	—	3
South Poison Cove	21.4	—	—	23.2	62.4	3
Goal Creek	—	4.7	—	4.7	—	1
Deep Bay	—	7.9	6.0	—	—	1
Total	50.6	84.8	46.5	90.3	62.4	

Source: Cameron, 1993

Table 4-37

Type of Log Transfer Facility Proposed for Each Site

Proposed LTF Site	Low-angle Slide	A-frame Bulkhead	Drive Down Ramp
North Ushk Bay			X
South Ushk Bay		X	
North Poison Cove	X		
South Poison Cove			X
Goal Creek			X
Deep Bay	X		

Source: Cameron, 1993

Table 4-38

Expected Amount of Intertidal and Subtidal Habitat Directly Impacted by Construction of Each LTF

Proposed LTF Site	Intertidal Area Affected (ft^2)	Subtidal Area Affected (ft^2)
North Ushk Bay	10,500	0[1]
South Ushk Bay	1,940	755-970
North Poison Cove	7,360	0[1]
South Poison Cove	7,200	0[1]
Goal Creek	9,200	0[1]
Deep Bay	10,655	0[1]

Source: Cameron, 1993

[1] Construction fill for low-angle slide and drive-down ramp LTFs generally does not extend beyond the low tide line.

Toxic materials are known to leach from woody debris, but do not accumulate to toxic levels except possibly within the pore water spaces of bark pieces. Of most concern is the increased chemical and biological oxygen demand resulting from the breakdown of accumulated woody debris. In some instances this increased demand has lowered the amount of dissolved oxygen in enclosed waters' levels below those allowed for coastal waters by the state of Alaska. These processes are transitory and may ameliorate over time even if bark accumulations are quite high and permanent. Levels of timber harvest proposed under all alternatives within this Project Area are moderate, and the length of harvest is short (three years). Therefore, bark accumulation will be low, and little if any impact upon the marine environment should occur. Even if an LTF is constructed within Deep Bay, the timber volume is so small that insignificant amounts of bark would accumulate.

Indirect Effects

Indirect effects of LTF construction and operation include introduction into the marine environment of operational debris such as the inadvertent loss into the subtidal of materials used in the bundling and rafting of logs; the introduction of waste materials such as bottles, cans, and other refuse through improper or careless handling by operations personnel; and the spill of petroleum products into the intertidal and/or subtidal during vehicle operation or maintenance. Such impacts can be minimized through the application of BMPs addressing the operations surrounding the transfer of logs into the water.

Cumulative Effects

The cumulative build up of woody debris over a significant term is dependent upon a continuous and somewhat regular input of material into an affected area. Cumulative effects of woody debris deposition are not expected within the Project Area because the total amount of timber volume available in the Project Area in one rotation is limited, and no other volume will be attributable from other areas to the proposed LTFs. The effects of woody debris leachates have been observed to decrease over time (11 years; Pease 1974), and organic detritus of plant origin that accumulates at the sediment surface may be decomposed either directly or indirectly by a myriad of marine bacteria, protozoa, and crustacea (Mann 1982). It is unlikely that any residual effects from the initial harvest would still be lingering if a second harvest from the Project Area were approved during the present rotation.

The most notable cumulative effects are likely to occur in the staging or storage of timber. All action alternatives call for the construction of an LTF in Poison Cove. Poison Cove is presently serving as a staging and storage area for timber harvested outside of the Project Area. Staging and storage of timber moved through an LTF at Poison Cove could significantly increase, at least over the term of the proposed harvest, the log rafting operations within Poison Cove. With the present level of timber storage occurring within Poison Cove there may not be sufficient storage space to handle the timber volumes that would be moved through Poison Cove. This is especially true for Alternative F, where all harvested timber would move through Poison Cove.

Most woody debris introduced into the marine environment results from the impact of logs with the water as the logs are transferred from the land to the sea. Additional yet minimal amounts of debris are produced through the process of rafting.

Additional timber staging and storage space will almost certainly be required. An inactive staging and storage area is located near the head of Ushk Bay. This site has not been used for log storage since 1985 when permits expired. If this site were reactivated some minimal, but cumulative, impacts could be expected. While conducting scuba diving surveys for the Ushk Bay project no woody debris or bark material that could be attributed to storage of logs at the site in Ushk Bay was observed. It is expected that whatever impacts may occur as the result of log storage in Ushk Bay from harvest of timber within the Project Area would be minimal and of no long term consequence.

Soils and Geology

Timber harvesting and associated road construction result in both direct and indirect adverse consequences, including soil disturbance, erosion, loss of soil, physical changes in soil characteristics, and productivity. The magnitude of soil disturbance and the associated consequences depend on factors such as topography, slope length, drainage characteristics, physical characteristics of the soils or bedrock exposed, area geology and geomorphology, depth of soil cover, precipitation, vegetative cover, and the measures used to minimize the effects.

The environmental analysis was based on the following assumptions:

- The road systems for Alternatives B, E, and F would be closed after timber harvest is completed. The road systems for the remaining action alternatives would remain open after completing the timber harvest.
- High lead and shovel logging techniques would not be used in areas mapped as Class 3 Mass Movement Hazard for the Project Area. Skyline and helicopter logging techniques would be used instead.
- Shovel logging would be restricted to well-drained areas with slopes less than 20 percent.
- The area disturbed by road construction is assumed to be 6 acres per mile.

Direct and Indirect Effects

The probability and magnitude of adverse environmental impacts differ among the alternatives based on the number of road miles constructed, the acres being harvested, the logging techniques employed, and the level of mass movement hazard in the affected areas. No karst topography or caves were found in the Project Area and there will be no adverse effects on cave resources under any of the alternatives.

Alternative A - No-Action
The No-Action Alternative proposes no timber harvest for the Project Area. Natural erosional processes would continue, including mass wasting and surface erosion.

Alternative B
This alternative proposes approximately 36 miles of road, requiring an estimated 216 acres of clearing for construction (Table 4-39). The roads would be closed after harvest operations, allowing the areas to revegetate. Less than one-half mile of road would be constructed in areas mapped as Class 4 (Extreme Mass Movement Hazard). The Class 4 portion is located in the lower reaches of the drainage known as the East Fork of South Ushk Creek, an area that is relatively sensitive to mass wasting and surface erosion because of the proximity of fish habitat. However, measures would be incorporated in the proposed road construction plans designed to minimize the adverse impacts.

Approximately four miles of proposed roads are in areas mapped as Class 3 (High Mass Movement Hazard). Mitigation measures to reduce adverse environmental impacts are identified on the road cards (see Appendix C).

Alternative B proposes approximately 1,670 acres of timber harvest (Table 4-40). Of this, approximately 533 acres of the harvest would be in Class 3 areas. Skyline logging has generally been proposed for Class 3 areas, which minimizes ground disturbance due to log yarding. Windthrow hazard resulting from harvest would be small because no harvest is proposed in the most vulnerable areas. The resulting increase in the potential for erosion and sedimentation would also be small.

Alternative B includes approximately 70 and 127 acres of highlead and shovel logging, respectively. These techniques have been proposed for areas mapped as Class 1 (Low Mass Movement Hazard). As a result, adverse soil disturbance would be limited to isolated soil compaction, puddling and detrimental displacement.

Alternative B also includes approximately 177 acres of helicopter logging in areas of restricted road access, which will limit adverse impacts of other logging techniques. Additional measures to reduce impacts are identified on the unit cards (see Appendix C).

Alternative C

This alternative proposes more than 62 miles of road, requiring approximately 376 acres of clearing for construction (Table 4-39). All of the permanent roads would remain open after harvest operations, requiring long-term maintenance to reduce the likelihood of possible adverse

Table 4-39

Acres (and Miles) of Roads by Mass Movement Hazard Class

VCU	Mass Movement Hazard Class	Road Acres (and Miles) by Alternative B	C	D	E	F
279	1	18 (3.1)	39 (6.5)	32 (5.3)	41 (6.8)	19 (3.1)
	2	11 (1.9)	25 (4.2)	9 (1.6)	31 (5.1)	11 (1.9)
	3	1 (0.1)	2 (0.4)	2 (0.4)	2 (0.4)	1 (0.1)
	4	0	4 (0.7)	3 (0.5)	4 (0.7)	0
280	1	16 (2.7)	58 (9.6)	57 (9.5)	51 (8.5)	55 (9.2)
	2	13 (2.2)	14 (2.3)	20 (3.3)	14 (2.3)	20 (3.3)
	3	5 (0.9)	9 (1.4)	13 (2.1)	13 (2.1)	13 (2.1)
	4	1 (0.1)	1 (0.2)	3 (0.5)	2 (0.3)	3 (0.5)
281	1	94 (15.7)	131 (21.8)	101 (16.9)	126 (21.1)	103 (17.2)
	2	38 (6.4)	46 (7.6)	40 (6.7)	49 (8.1)	40 (6.8)
	3	17 (2.8)	36 (6.0)	18 (3.0)	32 (5.3)	17 (2.8)
	4	2 (0.3)	11 (1.9)	2 (0.3)	11 (1.9)	2 (0.3)
	Total Acres (Miles)	216 (36.2)	376 (62.6)	300 (50.1)	376 (62.6)	284 (47.3)

Source: Langendoen et al. 1993

impacts. Approximately three miles of road are proposed in Class 4 areas, most of which are located in the same watershed as in Alternative B, where road construction could cause mass wasting and have an adverse impact on fish habitat (Bjerklie and Reub 1993). However, measures have been identified on the road cards (see Appendix C) to mitigate the possible adverse impacts, including full-bench, end-haul road construction utilizing gabion walls for slope support, and oversized culverts at stream crossings to reduce clogging with debris.

Approximately eight miles of proposed roads are in Class 3 areas. The roads are not concentrated in any of the drainages, but are instead dispersed throughout the Project Area. Mitigation measures to limit adverse environmental impacts are also identified on road cards (see Appendix C).

Alternative C proposes approximately 3,096 acres of total timber harvest (Table 4-40); approximately 622 acres, located along the Peril Strait, would be logged using group selection methods. By restricting logging to 2-acre groups in 15 to 25 percent of a unit area, group selection attempts to mitigate visual impacts in sensitive locations. Approximately 869 acres, mostly in

Table 4-40

Acres of Harvest Units by Mass Movement Hazard Class

VCU	Mass Movement Hazard Class	Alternative B	C	D	E	F
279	1	95	145	76	150	89
	2	78	366	95	242	78
	3	26	177	115	89	26
280	1	97	350	183	318	284
	2	100	136	95	142	100
	3	101	195	78	194	153
281	1	519	769	340	751	514
	2	228	249	170	245	228
	3	426	728	278	653	426
Total Acres		1,670	3,096	1,430	2,783	1,898

Source: Langendoen et al. 1993

group selection areas, would be harvested using helicopter logging methods.

Approximately one-third of the group selection areas are located in areas mapped as Class 3 hazard. The group selection technique could increase windthrow during storm events in the area along Peril Strait which has the most severe windthrow potential. This could increase mass wasting and erosion above current levels, which could in turn further affect the area's visual quality.

Approximately 1,110 acres of the timber harvest would be in Class 3 areas. Skyline logging has generally been proposed for these areas, minimizing ground disturbance due to log yarding. Additional measures to reduce impacts are identified on unit cards (see Appendix C).

Alternative C includes approximately 183 and 264 acres of highlead and shovel logging, respectively. These techniques are proposed for Class 1 and Class 2 areas. Consequently, adverse soil disturbances would be limited to isolated soil compaction, puddling and detrimental displacement.

Alternative D

This alternative proposes an estimated 50 miles of road, requiring approximately 300 acres of clearing for construction (Table 4-39). The permanent roads would remain open after harvest operations, requiring long-term maintenance to reduce the possibility of adverse impacts. Approximately 1.3 miles of road would be constructed in Class 4 areas, which are located in the lower reaches of the same watershed as in Alternative B where road construction could cause significant adverse impacts to fish habitat from mass wasting. Measures that would be incorporated into proposed road construction in order to mitigate these possible impacts include full-bench, end-haul road construction, and oversized culverts at stream crossings, and grizzlies above culverts to reduce clogging with debris.

Approximately 5.5 miles of the proposed roads are in Class 3 areas, mostly located in watershed 015A, in the upper reaches of watershed 018A, and above the coastline between Ushk Bay and Poison Cove. Mitigation measures to prevent adverse environmental impacts to fisheries and soil resources are identified on road cards (See Appendix C).

Alternative D proposes approximately 1,430 acres of timber harvest area (Table 4-40). Approximately 471 acres would be in Class 3 areas, for which skyline logging has generally been proposed to minimize ground disturbances due to log yarding.

This alternative includes approximately 87 and 171 acres of high lead and shovel logging, respectively, techniques proposed for Class 1 and Class 2 areas. As a result, adverse soil disturbances would be limited to isolated soil compaction, puddling and detrimental displacement. Helicopter logging will be used in areas of restricted road access, which will avoid adverse impacts of other logging techniques.

Alternative E

This alternative proposes an estimated 63 miles of road, requiring approximately 376 acres of clearing for construction (Table 4-39). The roads would be closed after harvest operations, allowing the roads to revegetate. Approximately three miles of road are proposed in Class 4 areas, the majority of which are located in the South Ushk Creek watershed. These roads could cause adverse impacts from mass wasting. As a result, relatively extensive measures will be incorporated in the plans and construction to mitigate possible adverse impacts.

Approximately eight miles of road are in Class 3 areas. These roads are not concentrated in any of the drainages, but are dispersed throughout the Project Area. Mitigation measures to limit adverse environmental impacts are identified on road cards where applicable (see Appendix C).

Alternative E proposes approximately 2,783 acres of total timber harvest area (Table 4-40). Approximately 936 acres are mapped as Class 3 areas. Skyline logging has generally been proposed for Class 3 areas, which will minimize ground disturbances due to log yarding.

This alternative includes approximately 198 and 287 acres of high lead and shovel logging, respectively, techniques proposed for Class 1 and Class 2 areas. Consequently, adverse soil disturbances would be limited to isolated soil compaction, puddling and detrimental displacement. Approximately 273 acres of the area will be harvested using helicopter logging methods in order to avoid adverse environmental impact to fish and soil resources resulting from road building.

Alternative F

This alternative proposes a little over 47 miles of road, requiring approximately 284 acres of clearing for construction (Table 4-39). The roads are proposed to be closed after harvest operations, allowing the disturbed areas to revegetate. Approximately one mile of road is proposed in Class 4 areas. Road construction in these areas could cause mass wasting. Relatively extensive measures to prevent adverse impact to fish habitat have been identified on the road cards (see Appendix C).

Approximately five miles of proposed roads are in Class 3 areas, mostly located in watershed 015A, in the upper reaches of watershed 018A, and above the coastline between Ushk Bay and Poison Cove. Mitigation measures to prevent adverse environmental impacts to fisheries and soil resources are identified on the road cards (see Appendix C).

Alternative F proposes approximately 1,898 acres of timber harvest area (Table 4-40). Approximately 605 acres would be in Class 3 areas, for which skyline logging has generally been proposed to minimize ground disturbances due to log yarding.

This alternative includes approximately 133 and 214 acres of high lead and shovel logging, respectively, techniques proposed for Class 1 and Class 2. Consequently, adverse soil disturbances would be limited to isolated soil compaction, puddling and detrimental displacement. Alternative F also includes approximately 178 acres of helicopter logging in areas of uneconomical or unstable road access, which will avoid adverse impacts of other logging techniques. Windthrow potential would be small.

Comparison of Alternatives

Alternative B proposes the fewest road miles of all the action alternatives. Alternatives C and E propose the most miles of roads of all the action alternatives. Most of the adverse effects will be mitigated during road layout, construction, and maintenance for all of the alternatives. However, the potential for adverse impacts is substantially greater for Alternatives C and E than for Alternative B because of the number of road miles in Class 4 areas, and the location of the roads with respect to the drainage. Overall, Alternatives D and F present slightly greater potential for adverse impacts compared with Alternative B, but significantly less than for Alternatives C and E.

Alternative D proposes the least amount of acreage (approximately 1,430 acres) for timber harvest. In contrast, Alternatives B, F, C and E propose approximately 1,670, 1,898, 3,139, and 2,783 acres, respectively. Alternative B proposes the highest proportion of skyline logging to minimize soil disturbance per timber harvest area, and Alternative C the lowest. By comparison, Alternative C proposes the highest proportion of helicopter logging (another means of minimizing soil disturbance) per timber harvest area, and Alternative D the lowest.

Cumulative Effects

VCU 281 contains approximately 321 acres which were previously logged in areas mapped as Class 1 and 2 mass movement hazard. No mass wasting was observed in these areas.

All of the planned timber harvest proposed in the alternatives would be completed before 2000. No additional harvest is scheduled or anticipated under any of the action alternatives within the forseeable future.

The roadway systems for Alternatives C and D would remain open after completion of the timber harvest, which will increase the time of their exposure. If properly maintained, the roads will not significantly contribute to surface erosion and mass wasting.

There are abundant opportunities for sport fishing, hunting, camping, and viewing scenery and wildlife in Southeast Alaska.

Recreation

The largely undisturbed natural landscapes of Southeast Alaska are abundant with opportunities for sport fishing, hunting, camping, day use, viewing scenery and wildlife, and many other recreational activities. Because so much of Southeast Alaska is inaccessible by road, water accessible and primitive opportunities are among its important resources, attracting visitors from all over the world. Although timber harvest activities can provide new recreational opportunities by improving access to some areas, they would alter the natural appearance of the landscape and would affect the recreational experiences of forest users. Impacts to recreation associated with timber harvest would result from road construction, timber removal, log transfer facilities, and logging camps. The most substantial impacts occurring during active timber harvest would be short-term, during a period of 3 to 9 years, depending on the alternative and the volume of timber to be removed.

The environmental consequences analysis of recreational resources was conducted in two parts: impacts of alternatives on the Recreation Opportunity Spectrum (ROS) classes, and impacts of alternatives on recreation sites and places. Each alternative was mapped and digitized into the Geographic Information System (GIS) and overlaid with inventory maps of ROS classes and recreation sites and places. The GIS was used to calculate the number of acres of ROS classes and recreation sites and places that would be affected by the timber harvest units, roads, and LTFs of each alternative. Impacts of timber harvest and road construction were evaluated by analyzing the changes in acreage that would occur in each ROS class under each alternative. If the physical setting, social conditions, or available recreation activities in the Project Area would be substantially affected by timber harvest or road construction activities, the ROS class would change accordingly. For example, road construction in previously unroaded areas would change the ROS class from Primitive or Semi-Primitive Non-Motorized to Roaded Modified.

The impact of timber harvest alternatives on recreation resources was based on the magnitude of change that would occur from timber harvest and road construction. Because recreational uses in the Project Area tend to concentrate at recreation sites and places, recreation opportunities available in these areas tend to be of greater concern to most forest users. Timber harvest activities would change the physical and social settings of these places which would degrade or intrude upon the recreational experiences of forest users. The level of change in settings and available recreation opportunities provide a measure of the environmental consequences of project alternatives on recreation resources. Three levels are used to differentiate between these impacts:

- High — Impacts would substantially change recreation opportunities available to the average forest user, or modifications to the landscape setting would preclude specific recreation activities. For example, road construction in a roadless area would preclude or degrade primitive recreation opportunities.
- Moderate — Impacts would degrade recreation experience opportunities, or modifications to the landscape setting would detract from the enjoyment of forest users engaging in specific recreation activities, such as camping, picnicking, and scenery and wildlife viewing. For example, an LTF and logging camp in a bay would intrude on the recreation experience available to the average forest user.
- Low — Impacts would intrude on the recreation experience of the average forest user, but could be easily overlooked.

Each alternative was assessed in terms of how timber harvest activities would affect recreation use volumes, patterns of use, activities, sites and places, and user origins. As noted above, the analysis was based on the change in acres in ROS classes and the proportion of sites and places affected by alternatives. The analysis also included the direction of the amended Tongass Land Management Plan (USDA Forest Service 1979, 1986) and the Tongass Land Management Plan Revision, Supplement to the Draft Environmental Impact Statement, Proposed Revised Forest Plan (USDA Forest Service, 1991c).

Direct and Indirect Effects

All the action alternatives, by providing roaded access, could potentially provide more diverse recreation opportunities by increasing the variety of activities, settings, and experiences available to forest users of the Ushk Bay Project Area. However, the alternatives would reduce opportunities for primitive or wildland recreation experiences. Timber harvest activities would cause visible changes in the natural character of the Project Area. All of these effects would persist until the natural appearance of the area returns. If no additional timber harvest entries occur in the part of the project area affected by the currently proposed harvest until the end of the rotation (for LUD III = 120 years, LUD IV = 100 years), the natural appearance would return gradually as the forest matures. From a visual contrast point of view, that would occur by about 70 years. The most substantial effects to recreation resources would occur during harvest activities, including noise, visual impacts, and direct conflicts between timber harvest and recreation activities. New roads would also diminish opportunities for solitude and degrade the primitive character of the environment.

The prospect of changes in the relatively undisturbed landscapes of the Project Area by timber harvest activities and road construction is of great concern to many of the public. For most forest users, physical changes to recreation settings would intrude upon their recreational experiences by altering the natural appearance of the viewed landscape. This is particularly true for the numerous travellers and tourists whose primary recreation activity is viewing the landscapes and wildlife of Southeast Alaska from the Alaska Marine Highway ferry. All the action alternatives would cause visible change in the natural character of the landscapes of the Ushk Bay Project Area, with Alternatives C and E causing the most apparent visual change (refer to Visual Resources section).

Project alternatives were developed to address the issues and concerns identified during the public scoping process. The main issue for recreation in the Ushk Bay Project Area revolves around the availability of Primitive and Semi-Primitive Non-Motorized recreation opportunities. Related to this issue, outfitters/guides are concerned that primitive opportunities needed to satisfy their clients' desire for wildland experiences would be reduced, forcing them to find other areas, change the services they offer, or go out of business.

In response to this issue, Alternatives B, E, and F would close the road systems to motorized use allowing the Project Area to gradually revert to Primitive and Semi-Primitive Non-Motorized opportunities as roads would become overgrown and harvest units would regenerate, given that no future entries were to occur. There would be a slight improvement in the recreation opportunities once active logging operations cease, however, the alteration of the physical and biological setting is a long-term effect as noted above.

Another major issue is concern for popular recreation places used by residents of Sitka, as well as many out-of-state visitors. Timber harvest and road construction would directly affect several of these recreation places. Users of these recreation places are concerned that some of their favorite places would be irrevocably damaged by timber harvest activities. Of the three recreation places affected by project alternatives, concern for those in Deep Bay and Ushk Bay was greatest. Alternative F responds to this issue by proposing no LTFs or logging camps in Deep Bay or Ushk Bay.

The boundary of the West Chichagof-Yakobi Wilderness is the ridge top that is the west boundary of the Project Area. It is possible that noise from harvesting and road construction in the large drainages of Deep Bay and Ushk Bay may temporarily reduce opportunities for solitude and wildland experiences of the West Chichagof-Yakobi Wilderness boundary user.

Recreation Opportunity Spectrum

Because most of the Project Area was inventoried as Primitive or Semi-Primitive, all the action alternatives would change the mix of recreational opportunities and experiences available to forest visitors. The action alternatives would all cause a reduction in primitive recreation opportunities in the Ushk Bay Project Area. Construction of roads in this unroaded area would provide access to inland and upland areas, enhancing motorized recreation opportunities. But it also must be noted that motorized recreation opportunities will be limited because the area will not be connected to a public road system or the Alaska Marine Highway.

Table 4-41 shows the potential change (in acres) in ROS classes that would occur for each alternative. Private lands in Deep Bay and Poison Cove are not included in these numbers.

The inaccessibility and primitive character of the Project Area's interior sections results from the absence of roads, and the dense forest cover that prevents the sights and sounds of boat traffic in Peril Strait from penetrating beyond the beach fringe. All action alternatives would result in Roaded Modified settings within one-half mile of the West Chichagof-Yakobi Wilderness. The construction of roads would cause a shift in recreation opportunities from Primitive and Semi-Primitive Non-Motorized class settings to Roaded Modified class setting. Under Alternatives C and D, where roads would remain open and would be maintained for roaded recreation opportunities (e.g. Roaded Modified), this shift would be long-term. Under Alternatives B, E, and F, roads would be closed to motorized use, allowing the Project Area to gradually revert to Semi-Primitive Motorized and Semi-Primitive Non-Motorized settings if not entered again.

ROS and Shoreline

Because access to most recreation places is by boat, most recreational use of the Ushk Bay Project Area occurs along the shorelines. Useable shoreline in the Project Area is concentrated in the protected bays because currents and exposure to severe weather make access to most of the shoreline along Peril Strait difficult and even dangerous.

LTFs also require protection from severe weather conditions and would be located in the bays of the Project Area. The presence and operation of LTFs in these bays (especially Ushk Bay) would result in direct adverse effects to the experiences of forest visitors using recreation places. Changes in the physical setting and conflicts with operations would reduce or eliminate some available recreation opportunities.

Table 4-41
Acres of ROS Classes

ROS Class		A[1]	B	C	D	E	F
				Alternative			
Primitive	acres	33,395	3,521	0	0	0	0
	percent	75	8	0	0	0	0
Semi-Primitive Non-Motorized	acres	5,928	26,545	21,830	27,299	20,186	26,431
	percent	13	60	47	61	45	59
Semi-Primitive Motorized	acres	5,172	3,498	1,318	2,431	2,012	3,984
	percent	12	8	3	5	5	9
Roaded Natural	acres	0	0	2,096	0	2,042	0
	percent	0	0	5	0	5	0
Roaded Modified	acres	0	10,931	19,951	14,765	20,255	14,080
	percent	0	24	45	33	45	32
Private Land	acres	8	8	8	8	8	8
	percent	0	0	0	0	0	0
Total	acres	44,503	44,503	44,503	44,503	44,503	44,503
	Percent	100	100	100	100	100	100

Source: Gault and Howell, 1993

[1] Alternative A is the no-action alternative and indicates the existing ROS inventory for the Project Area.

The degree to which the ROS class setting changes is a measure of the effect that project alternatives would have on shoreline recreation opportunities. Table 4-42 shows the miles of shoreline by ROS class and alternative. Alternative A, the No-Action Alternative, indicates the existing ROS inventory for shoreline in the Project Area.

Table 4-42
Miles of Shoreline by ROS Classes

ROS Class		A[1]	B	C	D	E	F
				Alternative			
Primitive	miles	0	0	0	0	0	0
	percent	0	0	0	0	0	0
Semi-Primitive Non-Motorized	miles	1.7	1.7	0	0	0	0
	percent	5	5	0	0	0	0
Semi-Primitive Motorized	miles	34.2	23.7	15.0	15.8	11.7	25.2
	percent	95	65	42	44	33	70
Roaded Modified	miles	0	10.5	20.9	20.1	24.2	10.7
	percent	0	30	58	56	67	30

Source: Gault and Howell, 1993

[1] Alternative A is the no-action alternative and indicates the existing inventory for the Project Area.

All of the action alternatives would cause substantial changes in the settings of shoreline areas in Ushk Bay. Alternatives B and F would cause substantial change in Ushk Bay, and would cause moderate changes in the overall Project Area. Alternatives C and E would cause substantial changes in much of the shoreline setting in the overall Project Area. Alternative B would affect only two of the three bays and cause the least overall change in shoreline areas.

ROS Effects By VCU

Under Alternative A, the No-Action Alternative, no existing recreational opportunities or locations would be affected. Opportunities for diversifying the mix of ROS classes and available recreation opportunities would not occur. Alternatives B-F (action alternatives) would change large areas of Primitive ROS settings to Roaded Modified and Semi-Primitive Non-Motorized settings. Each alternative would substantially change the mix of recreation opportunities available within each VCU. Table 4-43 shows the resulting ROS classes (in acres) that would occur for each alternative, with Alternative A representing the existing ROS inventory.

Alternative B would maintain nearly a quarter of the Primitive ROS settings in VCU 280. No other action alternative or VCU would have Primitive ROS. The Semi-Primitive Non-Motorized settings would decrease in all action alternatives in VCU 279, but increase substantially in VCUs 280 and 281. Roaded Modified ROS settings would be created over substantial

Table 4-43
Acres of ROS Classes

ROS Class	Alternative					
	A[1]	*B*	*C*	*D*	*E*	*F*
VCU 279						
Primitive	107	0	0	0	0	0
Semi-Primitive Non-Motorized	4,848	4,017	2,119	3,631	2,149	3,978
Semi-Primitive Motorized	2,548	2,309	1,318	1,685	1,285	2,305
Roaded Natural	0	0	324	0	356	0
Roaded Modified	0	1,176	3,741	2,186	3,712	1,219
Private Land	4	4	4	4	4	4
VCU 280						
Primitive	15,240	3,512	0	0	0	0
Semi-Primitive Non-Motorized	1,081	10,678	11,029	11,558	10,720	10,969
Semi-Primitive Motorized	371	378	341	354	726	864
Roaded Natural	0	0	85	0	71	0
Roaded Modified	0	2,115	5,234	4,780	5,175	4,859
Private Land	4	4	4	4	4	4
VCU 281						
Primitive	18,048	0	0	0	0	0
Semi-Primitive Non-Motorized	0	11,849	7,982	12,109	7,317	11,484
Semi-Primitive Motorized	2,253	811	0	392	0	814
Roaded Natural	0	0	1,687	0	1,616	0
Roaded Modified	0	7,641	10,632	7,800	11,368	8,003

Source: Gault and Howell, 1993

[1] Alternative A is the no-action alternative and indicates the ROS inventory for the Project Area.

percentages of each VCU in all the action alternatives. The largest changes in both acres and percentages occur in VCU 281, with up to 56 percent of the VCU becoming Roaded Modified in Alternative E. Alternatives C and E would eliminate Semi-Primitive Motorized settings from VCU 281.

Recreation Places

The most substantial effects to recreation resources in the Project Area would occur during active timber harvest when road construction, LTF operations, and other timber harvest activities would adversely affect recreation opportunities. Recreational boating, sport fishing, and crabbing activities would resume shortly after harvest activities, but perhaps at lower levels. The extent that roads and timber harvest activities affect recreation places and sites depends on how much the unique characteristics of their physical and social settings would be changed. Although minor changes to settings would probably not adversely affect recreation opportunities, major changes would preclude certain opportunities, for example primitive camping and wildland experiences. Table 4-44 shows the acreage of recreation places under each alternative.

Nine recreation places were identified during the inventory (see Table 3-23). All of the project alternatives would substantially affect primitive and semi-primitive experience opportunities in the recreation places of Ushk Bay and Poison Cove. Deep Bay would not be affected by Alternative B. Alternatives C, D, and E would change recreation places on the south side of the mouth of Deep Bay to Roaded Modified settings. Alternatives E and F would change recreation places to Roaded Modified settings in the large drainage northwest of Deep Bay within one-half mile of the head of the bay. In Alternatives C and D, an LTF site and access roads would substantially affect recreation opportunities in Deep Bay. Roads and timber harvest units would change the size and/or the ROS setting of recreation places. The influence of timber harvest units would change the ROS setting of all or a portion of a recreation place from its original setting (e.g., Semi-Primitive Motorized) to a Roaded Modified setting. In some cases, the setting of a recreation place would be split, resulting in two recreation places: the existing recreation and a new Roaded Modified recreation place, or if a remnant portion of the existing recreation place was too small, it would either be eliminated or added to an adjacent recreation place. This is illustrated in Table 4-44 as reductions or increases in the acres of recreation places or changes in ROS by alternative.

Alternatives B-F (action alternatives) would change Primitive, Semi-Primitive Non-Motorized, and Semi-Primitive Motorized recreation places in all three VCUs to Roaded Modified recreation places. In Alternatives C and D, roads would be left open, resulting in large new Roaded Modified recreation places. Alternatives C and D would combine the recreation places of South Shore, Point Marie, and Ushk Point into one recreation place in Ushk Bay. Alternative D would result in the greatest increase in recreation places for the Project Area.

Of the nine inventoried recreation places, three would be adversely affected by LTFs: Poison Cove, Deep Bay, and Ushk Bay. Although the LTFs would not be located at popular anchorages, LTF operations would deter most recreation users from entering the bays during active timber harvest. Some users may return to these places after timber harvest activities are completed, while other users might seek other locations. This is especially true of Ushk Bay, due to its importance as a recreation anchorage and access to king crab fishing. This anchorage is the only foul weather anchorage within an average radius of 15 miles from Ushk Bay. Displaced visitors seeking similar recreation opportunities may increase competition at other recreation places, for example, Big Bear and Baby Bear Bays.

Effects of LTFs on Recreation

Ushk Bay - Alternatives B, C, D, and E would locate an LTF in this popular recreation area. Because the LTF proposed for the south shoreline of Ushk Bay would be located behind an isthmus-like projection of land on the south shoreline of Ushk Bay, these operations would

Table 4-44
Acres of Recreation Places

Recreation Place No. Local Name	ROS	Alternative A[1]	B	C	D	E	F
VCU 279							
31080.01 Sergius Narrows	SPM	409	409	180	150	150	409
31082.01 Deep Bay Shoreline	SPM	560	560	560	560	560	560
31082.02 Deep Bay	SPNM	275	381	177	231	219	381
31082.03 Deep Bay Uplands	P	106	0	0	0	0	0
31101.01 Poison Cove Shoreline	SPM	542	239	0	0	0	237
31101.02 Poison Cove	SPNM	505	0	0	0	0	0
31101.02 Poison Cove	RM	0	543	0	0	0	564
31102.01 Shoreline/Road System		0	0	1,749	1,786	1,224	0
31083.01 Goal Creek	RM	0	0	400	0	400	0
31083.01 Peril Strait Shoreline	SPM	0	0	609	0	609	0
VCU 280							
31082.01 Deep Bay Shoreline	SPM	372	372	344	358	726	815
31082.02 Deep Bay	SPNM	320	207	0	17	0	234
31082.03 Deep Bay Uplands	P	2,459	0	0	0	0	0
31802.03 Deep Bay Uplands	SPNM	0	2,681	689	753	693	683
31082.04 Deep Bay	SPNM	0	0	0	0	0	0
31082.04 Deep Bay Road System[2]	RM	0	0	1,265	0	822	826
31102.01 Shoreline/Road System	RM	0	0	82	4,543	0	0

Table 4-44 (continued)

Acres of Recreation Places

Recreation Place No. Local Name	ROS	A[1]	B	C	D	E	F
VCU 281							
31102.01 Ushk Bay Shoreline	SPM	1,632	0	0	0	0	0
31102.01 Shoreline/Road System	RM	0	2,936	5,481	7,104	3,884	2,918
31102.02 Ushk Bay Uplands	P	3,148	0	0	0	0	0
31402.01 Point Marie	SPM	241	241	0	0	0	241
Total Acres of Recreation Places		11,896	11,900	14,045	20,403	11,688	11,154

Source: Gault and Howell, 1993

1 Alternative A is the no-action alternative.

2 New recreation places resulting from road systems and timber harvest.

have only low impacts on recreation use at the mouth of the bay. The LTF proposed for the north shore in Alternative E would be visible and would therefore more directly affect recreation use at the mouth of the bay. However, timber harvest and road construction along the shoreline of the bay by all the action alternatives would change the setting so that this recreation place would no longer provide Semi-Primitive Motorized experience opportunities. Harvest activities and LTF operations in Ushk Bay would probably reduce the crabbing, hunting, fishing, and beachcombing activities, and day and overnight use of popular anchorages in the head of the bay because the work activities would occupy some of the desired space and because many recreational users seek solitude.

The recreation site situated along the north shoreline of the bay is frequently used by successful crabbers picnicking on their catch. Recreation activities at this site would also probably be reduced in all action alternatives except F by the LTF, logging camp, and log rafting operations in Ushk Bay because some people would seek a place away from the noisy activity.

Poison Cove - All the action alternatives would locate an LTF at one of the two sites in Poison Cove and harvest timber in the large drainages west of Poison Cove. Timber harvest, road construction, and LTF operations in this recreation place by all the action alternatives would change the setting from Semi-Primitive Motorized experience opportunities to Roaded Modified opportunities. Alaska Pulp Corporation has had a log raft storage permit in Poison Cove from the State of Alaska for almost 30 years. People have continued to use the bay for hunting access and overnight use by anchoring to the log rafts (personal communication, Dinsmore 1994). Poison Cove is somewhat exposed offering less protection from severe weather than other surrounding bays.

Deep Bay - Alternative B would not affect this recreation area. Alternatives C and D would locate an LTF on the south shoreline near the middle of the bay. Operations at this LTF would interfere with crabbing, fishing, beachcombing, and the use of popular anchorages at the head of this narrow bay for the same reasons as in Ushk Bay. Harvest of several helicopter units on the slopes south of the bay by Alternatives C, D, and E would cause low to moderate impacts temporarily because of noise and placement of logs in the water. Because no LTF or roads are proposed in Deep Bay by Alternatives B and F, this recreation area would continue to provide Semi-Primitive Non-Motorized and Semi-Primitive Motorized experience opportunities shortly after the helicopter operations would be completed under these alternatives.

Other Recreation Effects

The Goal Creek LTF site, located south of Poison Cove on Peril Strait, is proposed in Alternatives C and E. Like the LTF sites in Poison Cove, this location would be highly visible from the boat traffic in Peril Strait. LTF operations at these sites would cause high impacts in a small area to the recreation experiences of ferry travellers and pleasure boaters in the strait (see Visual Resources section of this chapter). Following completion of timber harvest activities, the LTF sites would provide direct access to road systems.

The specific location and layout of the logging camp would be planned with the assistance of a landscape architect to minimize potential adverse visual effects (e.g., clearing trees, screening structures from view). Alternatives E and F would locate a land-based logging camp at Poison Cove. The presence of a logging camp at Poison Cove under these alternatives would compound the effects of the LTF locations on ferry travellers and small pleasure boaters in Peril Strait, further reducing the wildlands quality of their recreation experience. Approximately seventy residents would occupy the camp for nine months each year, with the population decreasing to twelve during the winter. The camps residents would have a significant advantage to the existing and developing (road access) recreation opportunities available in the surrounding area. This advantage would continue until the camp is closed, 3-9 years depending on how the timber sales are released. Also during the time when the camp is open, non-resident recreationists are not particularly welcome because of the potential liability to the logging camp contractor.

Alternatives B and D would locate a land-based logging camp at Ushk Bay. The presence of this camp under these alternatives would compound the effects of the LTF site on users of the anchorages at the head of the bay and shoreline areas, further reducing opportunities for solitude and primitive recreation opportunities in this popular bay. Alternative C proposes a floating logging camp in Ushk Bay. Although this would reduce the disturbance of shoreline areas somewhat, the presence of a floating camp would also compound the effects of this LTF location on users anchoring, fishing, and crabbing in Ushk Bay, especially if it is located at the favorite anchorage.

Interconnected road systems in Alternatives E and F would provide inland access to other VCUs and the other bays along the major drainages for hunting, stream fishing, ATV use, and other activities. However, the road system in these alternatives would not be maintained and would become blocked by alder in five to seven years. Although the road systems of Alternatives B and C are not interconnected, roads would still provide new inland access for recreation activities until alder growth blocks access. Because Alternative B proposes the fewest miles of road in the Project Area, it would have the least potential for recreation opportunities from roads. The road systems of Alternatives C and D would be maintained by the Sitka Ranger District, providing long-term access to roaded recreation opportunities in the Project Area.

Timber harvest activities in Alternatives C, D, E and F would occur in the large drainage west of Deep Bay. All of these alternatives, except Alternative F, would also harvest several helicopter units on the slopes above the bay visible to passengers on the Alaska Marine highway ferry route (see Visual Resources section of this chapter). Because the road systems in Alternatives C, D, E and F would traverse bottomland areas at the head of Deep Bay, motorized access to inland areas would provide fishing opportunities in this stream and its tributaries. However, these alternatives would also affect recreation use of private lands at the head of Deep Bay (also refer to the Subsistence Section). Motorized use on the roads left open in Alternatives C and D would increase competition for hunting and stream fishing opportunities.

Changes in ROS classes to Roaded Modified would be long-term under Alternatives B, E, and F. The road systems would be closed to motorized vehicles after the harvest, allowing roads and harvested areas to regrow to brush and tree cover. The roads would remain open to hiking, providing access to big game hunting, stream fishing, and wildlife viewing. Foot traffic for these activities may delay complete overgrowth of some road segments for several years and possibly indefinitely. The roads and harvest units will, if undisturbed, gradually revert to a semi-primitive setting. The thick growth of brush and young trees that regenerate in harvest units makes them virtually impenetrable for many years until the canopy is high and dense enough to shade out understory growth.

Special Use Permits

In most cases, existing recreation special use permits would be less desirable in areas where timber harvest activities have occurred and perhaps not at all while harvest activities are occurring. Many outfitter/guides would likely seek permits in undisturbed areas. Although the new roads in the Project Area would enhance access, most forest visitors that hire outfitters/guides are generally seeking wildland experiences as an integral part of their hunting, fishing, sightseeing, photographic, or other recreational pursuits.

Bear hunting is one of the primary interests for many Project Area visitors that hire outfitters/guides. Timber harvest activities under any of the action alternatives in the Ushk Bay Project Area would likely affect bear use patterns of the area and would certainly affect the guided hunts. During harvest activities, the five special use permit holders in this area would probably take their clients elsewhere.

Alternative B would not enter the southern third of the Project Area around Deep Bay and would therefore not displace use in this portion of the Project Area. The large number of harvest units and extensive road systems of Alternatives C and E would likely displace outfitter/guide use throughout the Project Area. Although Alternatives D and F would both have extensive interconnected road systems, they would have fewer harvest units that would be more dispersed, leaving large portions of the Project Area undisturbed. The road systems under these alternatives would provide easier access to large undisturbed upland areas that may be desirable to some forest visitors using outfitters/guides.

Timber harvest activities in the Ushk Bay Project Area would likely displace, and in some cases eliminate, outfitter/guide services in the Project Area. Although much of Southeast Alaska remains undisturbed and available for use by outfitters/guides, remaining areas tend to be inland and more difficult to access. The Ushk Bay Project Area is very popular for outfitter/guide use because it is near Sitka and can be easily accessed. Timber harvest in this area would likely increase the competition for other areas to which outfitter/guides might be displaced. Some outfitters/guides may choose to offer a substitute service (e.g., hunting in a roaded yet remote setting) if a market for the substitute product can be attracted.

In all the action alternatives, except Deep Bay under Alternative B, outfitters/guides whose clients are seeking wildland experiences would be displaced from anchorages and areas being actively logged. Alternatives C and D would maintain the road systems following timber harvest, which would likely result in long-term displacement of outfitters/guides providing wildland experiences. Alternatives B, E, and F would close the road systems following timber harvest, which would result in short-term (from 3 to 9 years, depending on how the sale is released) displacement of outfitters/guides providing non-wildland experiences.

Recreation Use and Trends

Recreation use and trends in the Ushk Bay Project Area can be viewed in context with the whole of Southeast Alaska as analyzed in the Supplement to the Draft EIS for the TLMP (USDA Forest Service 1991d). Current recreation use patterns can be used to understand and project demand for different recreation settings desired by the recreating public. The demand for all ROS class settings is growing. The largest growth appears to be demand for Semi-

Primitive Motorized opportunities. The demand for Semi-Primitive Motorized opportunities will exceed the availability on the Tongass National Forest by 2001. Currently, all ROS class settings can be met in the future.

Because access to recreation places in Southeast Alaska is by boat, most Semi-Primitive Motorized opportunities are associated with shoreline and beach fringe areas. All the action alternatives would reduce available Semi-Primitive Motorized opportunities in the Ushk Bay Project Area. Alternatives C and E would cause the greatest decline in Semi-Primitive Motorized opportunities in the Project Area, while Alternatives B and F would affect the least. The decline in Semi-Primitive Motorized opportunities would likely cause some displacement of activities to other areas. Displacement may also increase competition for the use of remaining undisturbed areas, and increase pressure on the West Chichagof-Yakobi Wilderness and adjacent LUD II areas. Recreation users of the Ushk Bay Project Area would generally respond to timber harvest in one of four ways: 1) choose to pursue recreation activities in other locations (i.e., displacement), 2) cease engaging in a particular activity, 3) substituting recreation activities, or 4) adapting to a modified recreation setting. These responses may be different during logging activities than after logging ceases.

Wild and Scenic Rivers

None of the project alternatives would affect the values of any eligible or recommended wild and scenic river within or adjacent to the Ushk Bay Project Area.

Roadless Areas

The Hoonah Sound roadless area comprises 93,880 acres. Approximately 47 percent of this roadless area is in the Ushk Bay Project Area, and is allocated to land use designations which allow moderate and intensive development (LUDs III and IV). The remaining 53 percent of the roadless area is allocated to LUD II which allows the land to be managed in a natural roadless setting.

In Alternatives C through F, the entire Project Area would lose its potential for future consideration for Wilderness as a result of fragmentation by the 47 to 65 miles of new roads. In Alternative B, the Deep Bay drainage and Peril Strait shoreline would not be harvested; these areas may continue to qualify as a potential Wilderness Area whereas the remainder of the Project Area would not qualify. Under Alternative A, the Project Area would remain roadless, and would continue to meet the criteria for potential inclusion in the National Wilderness System. Under all alternatives, the remaining 53 percent of the Hoonah Sound roadless area outside of the Project Area also would continue to qualify as a potential Wilderness area.

Cumulative Effects

Timber harvest activities planned north, east, and south of the Project Area (Southeast Chichagof, Northwest Baranof, North Kruzof), would likely increase demand on existing recreation places near Sitka. Displacement of opportunities from the Peril Strait area north of Sitka, including the Ushk Bay Project Area, may substantially increase the time and effort required to access alternative recreation places with similar opportunities.

As analyzed in the Supplement to the Draft EIS for the TLMP (USDA Forest Service 1991d) there appears to be an adequate supply of all recreation settings to meet forest-wide projected demands, except Semi-Primitive Motorized. Because of the marine-oriented nature of recreation in Southeast Alaska, the most sought after recreation opportunities tend to be in the Semi-Primitive Motorized ROS class.

Timber harvest tends to increase the proportion of Roaded Modified opportunities while somewhat reducing Semi-Primitive Motorized opportunities. It appears that the cumulative effect of timber harvests in the region may be the continued loss of primitive opportunities and shortage of Semi-Primitive Motorized opportunities.

When combined with the other timber harvests planned in the vicinity of the Ushk Bay Project Area, timber harvest activities are beginning to alter the largely primitive character of the landscapes in the area. When considered cumulatively, timber harvest has adverse effects on outfitters/guides providing a wildland experience, but it will only directly affect outfitters/guides providing non-wilderness experience during the active harvesting period.

Visual

The largely undisturbed natural landscapes of Southeast Alaska are abundant with opportunities for viewing scenery and wildlife and offer an important tourist attraction to numerous visitors from all over the world. However, timber harvesting could substantially alter the area's scenic landscapes. Through careful planning and management, it is possible to harvest timber while maintaining the visual resources of surrounding landscapes. The visual impacts of timber harvests are primarily the result of timber removal, but are also caused by road construction, log transfer facilities (LTFs), and personnel camps. These activities can dominate views and create unnatural appearing forms, lines, colors, and textures in the landscape that are inconsistent with the characteristic appearance of natural landscapes.

The assessment of visual impacts was conducted in two parts. First, landscape changes in the Project Area associated with each alternative were evaluated and compared to the inventoried Visual Quality Objectives (VQOs) and with VQOs proposed in the TLMP Revision. Second, landscape changes for each alternative were evaluated to determine their effects on views from sensitive viewpoints.

Views from boats at the mouth of Deep Bay would be unchanged.

Deviation from VQOs was determined through an evaluation of potential changes in the landscape that would result from each timber harvest alternative (e.g., harvest units, roads, LTF locations, and logging camps locations). The analysis considered potential changes in form, line, color, and texture in the landscape caused by timber harvest activities to determine if these changes would meet VQOs. The analysis used three visibility distance zones, foreground (0-1/2 mile), middleground (1/2-3 to 5 miles), and background (3-5 to 10 miles and beyond), to evaluate potential changes in the landscape to determine how they would be perceived from sensitive viewpoints and whether or not they would meet VQOs. Refer to the Glossary for further explanation of terms.

In anticipation of the Tongass Land Management Plan Revision (TLMP Revision) that may be completed soon, the visual analysis of Project Area landscapes evaluated the effects of timber harvest alternatives on adopted VQOs as displayed in the proposed revised Forest Plan. Because inventoried VQOs are based on current conditions under the TLMP, the visual analysis also evaluated the effects of the timber harvest alternatives on inventoried VQOs. Management direction for the Project Area's VCUs differs somewhat between TLMP and TLMP Revision. For this reason, there are cases where the visual effects of timber harvest and road construction may be consistent with a less restrictive adopted VQO but not be consistent with a more restrictive inventoried VQO.

Notable visual impacts typically occur when major visual changes are noticeable from sensitive viewpoints in landscapes that are homogeneous and contain little variety or diversity. Visual changes seen from middleground and background views are usually less obvious unless the change is to a focal point or local landmark.

Video simulation techniques and computer-generated three-dimensional graphics aided the analysis of visual impacts. Computer simulations were used in conjunction with field observations and topographic map analysis (visibility modeling) to estimate how each alternative would be perceived in the landscape. Video simulations were prepared to illustrate the visibility of timber harvest units, LTFs, logging camps, and roads as they are predicted to appear when viewed from two selected viewpoints. Viewpoint #1 depicts the view into Poison Cove from the Alaska Marine Highway ferry route in Peril Strait. Viewpoint #2 depicts the view into Ushk Bay from a small boat positioned just outside the mouth of the bay.

General Consequences

Timber Harvest and Road Construction

Each project alternative, except Alternative A (No Action), displays various timber harvest units, road systems, log transfer facilities (LTF), and logging camps. Implementation of these components would cause visual impacts of varying degrees of size and intensity, depending on their location, distribution, and visibility. Clearcut harvest methods are typically used in spruce-hemlock forests such as that found in the Ushk Bay Project Area. As a result, timber harvest activities cause unnatural forms, lines, colors, and textures that are noticeably inconsistent with the characteristic rough, homogenous texture of Southeast Alaska landscapes.

Because the visual absorption capability of Project Area landscapes is largely low, with some intermediate levels in inland areas, timber harvest alternatives would cause dramatic visual changes that would significantly affect sensitive viewpoints in the foreground and middleground distance zones. For this reason, most harvest units would not meet the inventoried VQOs, and in many cases, would not meet the adopted VQOs for foreground and middleground views.

Table 4-45 shows the change in the visual quality levels (in acres and percent of the Project Area), based on inventoried VQOs, that would result from implementation of each of the timber harvest alternatives.

Table 4-45
Acres by Visual Quality Objective and Percent Change

VQO		Alternative A[1]	B	C	D	E	F
Retention	acres	3,776	3,774	3,666	3,706	3,694	3,774
	% change	0	-<1	-3	-2	-2	-<1
Partial Retention	acres	24,051	22,941	21,715	23,061	22,125	22,940
	% change	0	-5	-10	-4	-8	-5
Modification	acres	12,385	11,744	11,556	11,991	11,537	11,729
	% change	0	-5	-7	-3	-7	-5
Maximum Modification	acres	4,291	6,044	7,566	5,745	7,147	6,060
	% change	0	+41	+76	+34	+67	+41

Source: Gault and Howell, 1993

[1] Alternative A is the no-action alternative and indicates the existing VQO inventory in the Project Area.

Harvest units under any of the action alternatives would cause moderate visual impacts to views from small aircraft flying over the Project Area along Peril Strait. In fact, most of the harvest units in the Project Area would be quite evident from an aerial perspective. In addition, the effects of road construction tend to be more pronounced when viewed from aircraft.

Log Transfer Facilities (LTFs) and Logging Camps

LTFs are located on shoreline areas, typically in protected bays, to facilitate the transfer of logs into the water where they can be collected in log rafts and transported. Because of their size, bold linear shape, color, and shoreline location, LTFs usually create strong visual contrasts with the surrounding landscape and are generally quite evident to viewers. Because most forest users in the Project Area rely on small boats to access the forest, viewpoints are usually located in the foreground distance zone, where visual impacts would be substantial. However, the relatively low profile of ramp or slide LTFs makes them less noticeable to distant middleground and background views. Visual contrast associated with the form and structure of the bulkhead of an A-frame LTF and the color of the A-frame itself would result in moderate visual impacts to middleground and background views (e.g., Alaska Marine Highway and other boat traffic on Peril Strait).

LTFs which use a bulkhead have a greater tendency to create strong visual contrast. LTFs which do not use bulkheads may have less impacts, provided mitigation measures are implemented. For ramp type LTFs the facility would be constructed so that it blends with the surrounding shoreline. Mitigation measures would include softening the edges to prevent the introduction of hard geometric forms and the use of on-site rock to prevent distinct color contrasts.

Clearings for sort yards and logging camps also contribute to the visual impacts of LTF sites. However, because they are usually located in level or gently sloping areas, visual contrasts tend to be somewhat absorbed when viewed from saltwater viewpoints. A floating logging camp is proposed for Alternative C. Although openly visible from saltwater viewpoints, the visual impacts of floating camps tend to be less pronounced than land-based camps that require more clearing. Land-based camps, because of the clearing required, would have more long-term visual effects than floating camps. The effect could be reduced by leaving some forest as a visual screen.

Previous timber harvest along Ushk Bay.

Direct and Indirect Effects

Timber Harvest and Road Construction

Alternative A: No-Action Alternative

Because this alternative calls for no timber harvest, it would not affect the Project Area's existing visual condition.

Figure 4-3 illustrates the existing visual condition of Project Area landscapes as they would be viewed from the two selected viewpoints.

Alternative B

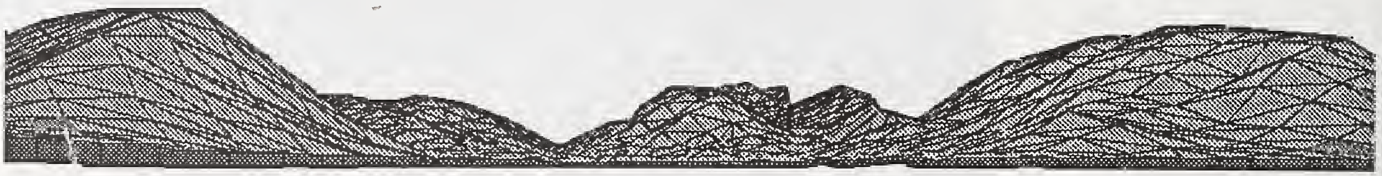
Alternative B calls for the second fewest number of timber harvest units. The units would be consolidated and located mainly in several drainages in Ushk Bay and Poison Cove, mostly within VCU 281. Although timber harvest activities would occur in all three VCUs in the Project Area, only harvest units in the drainages west of Poison Cove would be visible from Peril Strait. Harvest units in Ushk Bay would be visible from small boats that enter the bay for recreational purposes.

The simulations in Figure 4-4 illustrate the visibility of timber harvest units, LTFs, logging camps, and roads under Alternative B as they are predicted to appear when viewed from the two selected viewpoints.

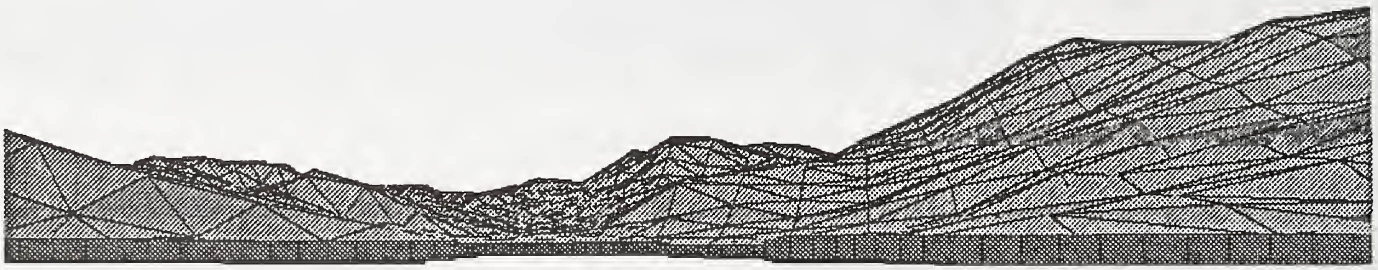
VCU 279 - Harvest units in the large drainages west of Poison Cove (Units 27, 31, 31-A, 33, 101, 102, and 103) are located on north and south facing slopes, and would be visible to middleground and background views from the Alaska Marine Highway ferry route in Peril Strait. Views from Peril Strait would be at oblique angles, causing moderate visual impacts (i.e. a moderate disruption of the visual landscape) to ferry travellers and small pleasure boat users in the strait. These units would not meet the inventoried Partial Retention VQO for the area, but would meet the adopted Modification VQO for middleground views in this area. Parts of two harvest units (30 and 102) that would be viewed in the background would meet the inventoried Partial Retention VQO. The remaining harvest units in the area (30-A, and part of 30) would be unseen.

VCU 280 - Three harvest units (34, 35, 36), located on the mid-slopes of the north drainages west of Poison Cove, would be the most evident to middleground views from Peril Strait.

Figure 4-3
Existing Visual Conditions - Alternative A



Viewpoint #1



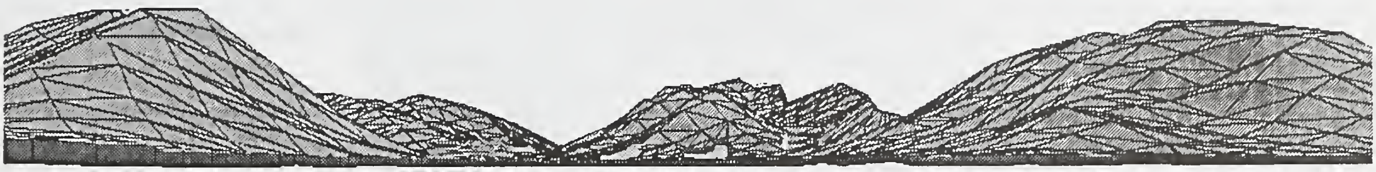
Viewpoint #2

These units would not meet the inventoried Partial Retention VQO; however, they would meet the adopted Modification VQO for middleground views in the area. One harvest unit located in the southern drainage west of Poison Cove (part of Unit 30) would be viewed in the background from Peril Strait. However, because the unit would be viewed at an oblique angle and be partially screened by surrounding terrain, it would meet the inventoried Partial Retention VQO. The remaining units in the drainage (28, 29, 29-A, 30, and 52) would be unseen.

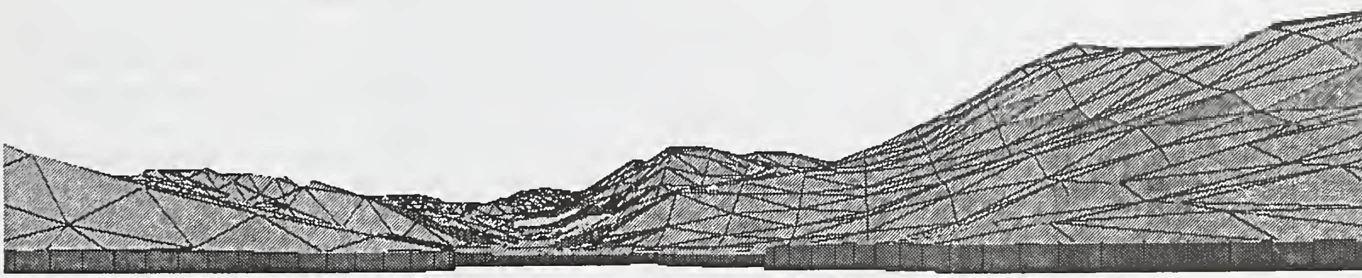
VCU 281 - The majority of harvest units under Alternative B would occur in this VCU along slopes of large drainages to the north, west, and south of the head of Ushk Bay. The first several harvest units in these drainages would be visible to middleground views from small boats in the bay. Because views into these drainages would be mostly at oblique angles to the harvest units, the perceived change in the landscape, and therefore the visual impacts, would be moderate. Although the units would meet the adopted Maximum Modification VQO for middleground views in this area, they would not meet inventoried Partial Retention VQO for much of the area.

Except for the leading edges of two units (72 and 75), harvest units in the large drainage south of the head of Ushk Bay (Units 15, 16, 16-A, 37, 37-A, 74, 74-A, and 77) would be unseen from the bay. Similarly, except for the leading edges of two units (4 and 8), harvest units in the drainage north of Ushk Bay (Units 5, 5-A, 90, 86, and 86-A) would also be unseen. Like the other two groups of harvest units in this area, the first two units (12 and 81) in the drainage to the west of Ushk Bay would be visible to middleground and background views from the bay, while the remaining units (7, 7-A, 10, 11, 78-A, 78-B, 78-C, 78-D, 78-E, 79, 79-A, and 79-B) would be unseen. The visible portions of harvest units in these drainages would not meet the inventoried Partial Retention VQO. However, they would meet the adopted Maximum Modi-

Figure 4-4
Simulations - Alternative B



Viewpoint #1



Viewpoint #2

fication VQO for middleground views for the area.

Two harvest units just north of the head of Ushk Bay (13 and 82) would be highly visible to foreground and middleground views from small boats in the bay. Because these units would be located on slopes above the shoreline, views would be direct and result in high visual impacts. These units would not meet the adopted Modification VQO for foreground views for the area.

Three harvest units along the south shoreline (40, 67, and 68) and two units on the north shoreline of Ushk Bay (3 and 89) would be highly visible in the foreground and middleground to views from small boats in the bay. Two of these units (67 and 68) would be adjacent to an LTF that would be developed on the south shoreline of Ushk Bay behind a point that juts into the bay. Visual impacts of LTFs are described below. Because all of these harvest units are located near the shoreline, views would be direct and would result in high visual impacts to foreground views. However, because the harvest units in this area are relatively small, they would meet the adopted Modification VQO for foreground views in this area.

Alternative C

Alternative C would harvest the second highest acreage in the Project Area with a large number of harvest units in all three VCUs. Most of the timber harvest activity would occur in the area around Ushk Bay (VCU 281). Units would be consolidated mostly along large drainages with a few units scattered along the shoreline of Ushk Bay. This alternative would significantly alter landscapes in the Project Area.

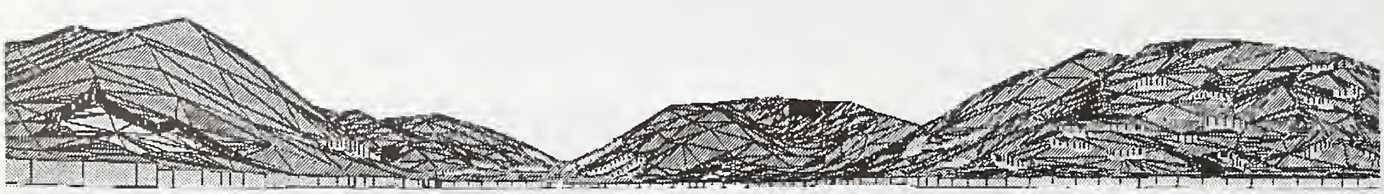
Several large areas along Peril Strait (labeled Group I-VI) would be harvested as group selections. Two-acre or smaller patches would be cut throughout the units, harvesting approximately 25 percent of the total unit area. The homogenous texture of the forest cover would be altered by this harvest method, causing a somewhat mottled appearance that would be noticeable but visually subordinate in the landscape. The group selection units along Peril Strait would be visible in the middleground to views from the Alaska Marine Highway ferry route. They would result in moderate visual impacts and would meet inventoried Partial Retention VQO for middleground views in this area, but would not meet this VQO for foreground views.

The simulations in Figure 4-5 illustrate the visibility of harvest units, LTFs, logging camps, and roads under Alternative C as they are predicted to appear when viewed from the two selected viewpoints.

VCU 279 - The visual impacts of harvest units in the large drainages west of Poison Cove would be the same as described in Alternative B, except that one unit on the slope north of the cove (50) and two large group selection units north and south of the cove (Groups I and II) would increase the overall visual impacts to middleground views from the Alaska Marine Highway ferry route.

A large group selection unit north of Poison Cove (Group II) would be visible in the middleground to views from the ferry route in Peril Strait, but would meet inventoried Partial Retention VQOs for the area. Another large group selection unit (Group I) south of Poison Cove would be visible in the foreground to views from the ferry route in Peril Strait, but would not meet the inventoried or adopted Partial Retention VQOs of this scenic area. One harvest unit (50), located north of Poison Cove adjacent to a large group selection unit, would be partially screened to some foreground views from Peril Strait; however, it still would not

Figure 4-5
Simulations - Alternative C



Viewpoint #1

Viewpoint #2

Previous timber harvest at Ushk Bay occured in the 1960s.

meet the inventoried or adopted Partial Retention VQOs for the area.

In the drainage south of Poison Cove, one harvest unit (110) would be seen in the foreground and would result in high visual impacts to travellers on the ferry. This unit would not meet the inventoried Retention VQO or adopted Partial Retention VQO for the area. All the other harvest units in this drainage would be visible to middleground views from the ferry and would result in high and moderate visual impacts. These units would not meet the inventoried Partial Retention VQO for middleground views in the area. However, because the majority of the units would be viewed at somewhat oblique angles, they would meet the adopted Modification VQO for middleground views for the area.

Unit 26, located south of the mouth of Deep Bay, would be highly visible to foreground views from the ferry lane and would result in high visual impacts to ferry and small cruise ship travellers in Peril Strait and small pleasure boaters in the bay. This unit would not meet the inventoried Retention VQO or adopted Partial Retention VQO for foreground views in the area.

VCU 280 - The visual impacts of harvest units in the large drainages west of Poison Cove that extend into this VCU from VCU 279 would be the same as described under Alternative B.

In addition, the first several harvest units (21, 21-A and 23) located in the main drainage at the head of Deep Bay would be visible in the foreground and middleground to views from small boats in the bay. These would result in low to moderate visual impacts to foreground views from boats anchored near the head of the bay. Because the units would be located in a fairly flat area and would be viewed at very oblique angles, they would meet the inventoried Partial Retention VQO for the area. The rest of the harvest units in the area (19, 20, 22, and 22-A) would be unseen.

Four dispersed harvest units (25, 25-A, 25-B, and 25-C), located high on the slopes south of Deep Bay, would be visible in the foreground to views from Deep Bay and in the middleground from Peril Strait. Although these units would be relatively small and most would be viewed at oblique angles, they would be quite evident on the steep slopes and would result in high visual impacts to views from small boats and moderate impacts to travellers on the ferry. These units would not meet the inventoried Retention VQO or adopted Partial Retention VQO for foreground views in this scenic area.

VCU 281 - The visual impacts of harvest units in the large drainages west and south of the head of Ushk Bay in this VCU would be the same as described under Alternative B.

In addition, six harvest units (40, 43, 55, 53, 67, and 68), dispersed along the south shoreline of Ushk Bay, would be highly visible to foreground and middleground views from small boats in the bay. Two of these units would be adjacent to an LTF planned on the south shoreline of Ushk Bay behind a point that juts into the bay. Because these units would be located near the shoreline, views would be direct with high visual impacts. However, they would meet the adopted Modification VQO for foreground views in the area because they are dispersed and relatively small. Three other units in this VCU (39, 41, and 70), located in drainages south of Ushk Bay, would be unseen.

Alternative C would harvest several large areas along Peril Strait north and south of the mouth of Ushk Bay as group selections. Approximately 25 percent of the total area of these group selection units would be harvested. Four group selection units (Groups III, IV, V, and VI) located along Peril Strait would be visible to middleground views from the Alaska Marine Highway ferry route. These units would result in moderate visual impacts and would not meet the inventoried Partial Retention VQO for the area. A large group selection unit north of Poison Cove (Group II) would be visible in the middleground to views from the ferry and would result in low to moderate visual impacts. This unit would meet inventoried Partial Retention VQOs. Another large group selection unit (Group I), located south of Poison Cove, would be visible in the foreground to views from the ferry. This unit would cause moderate visual impacts and would not meet the inventoried or adopted Partial Retention VQOs for this scenic view area because harvesting 25 percent of this large unit would dominate foreground views.

Alternative D

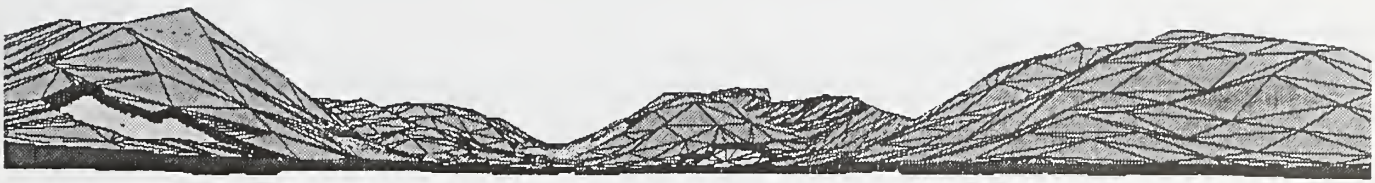
This alternative would affect the smallest portion of the Project Area. Harvest units would be widely spaced and dispersed throughout the three VCUs. Timber harvest activities would occur largely in the same drainages in Ushk Bay, Poison Cove, and Deep Bay, similar to the other alternatives, except the intensity of harvesting would be reduced. Overall, this alternative would cause fewer significant visual effects in most areas. However, several harvest units (e.g. 2, 48, 50, 55, 60) would cause high visual impacts to views from the ferry route and small boaters in Peril Strait and Ushk Bay. Harvest units in valleys beyond the shore would generally meet inventoried VQOs.

The simulations in Figure 4-6 illustrate the visibility of timber harvest units, LTFs, logging camps, and roads under this alternative as they are predicted to appear when viewed from the two selected viewpoints.

VCU 279 - Harvest units in the large drainages west of Poison Cove on north and south facing slopes would be visible in the middleground and background to views from the Alaska Marine Highway ferry route in Peril Strait. Views of travellers on the ferry and small pleasure boats in the strait would be at oblique angles and would result in moderate visual impacts. Three harvest units (27, 31, and 31-A) would not meet the inventoried Partial Retention VQO; however, they would meet the adopted Maximum Modification VQO for middleground views for the area. Parts of two harvest units (30 and 102) that would be viewed in the background would meet the inventoried Partial Retention VQO. The remaining harvest units in the area would be unseen.

Three harvest units (48, 50, and 80), located on the slopes north of Poison Cove, would be visible in the foreground to views from the ferry in Peril Strait. Although these units would be

Figure 4-6
Simulations - Alternative D



Viewpoint #1

Viewpoint #2

partially screened to some foreground views from the strait, they would not meet the inventoried or adopted Partial Retention VQO of this scenic area.

Unit 26, located south of the mouth of Deep Bay, would be highly visible to foreground views from the ferry lane and would result in high visual impacts to ferry and small cruise ship travellers in Peril Strait and small pleasure boaters in the bay. This unit would not meet the inventoried Retention VQO or adopted Partial Retention VQO for foreground views in the area.

VCU 280 - Two harvest units (35 and 36), located on the mid-slopes of the north drainage west of Poison Cove, would be the most evident to views from Peril Strait. The remaining units in this drainage (28, 30-A, 32-A, and 98) would be unseen.

The first harvest unit (21), located in the main drainage at the head of Deep Bay, would be visible in the middleground to views from small boats in Deep Bay. This unit would result in low to moderate visual impacts to views from small boats anchored near the head of the bay. Because the unit is located in a fairly flat area and would be viewed at very oblique angles, it would meet the inventoried Partial Retention VQO of this area. The rest of the units in this area (19, 20, 22, and 22-A) would be unseen.

Unit 25, located high on the slopes south of Deep Bay, would be visible in the foreground from the bay and in the middleground from Peril Strait. Although the unit would be relatively small and somewhat screened by a hill to views from the strait, it would be quite evident on the steep slopes and would result in moderate to high visual impacts to foreground views. Thus, it would not meet the inventoried Retention VQO or adopted Partial Retention VQO for foreground views in this scenic area.

VCU 281 - The majority of harvest units in this VCU would occur along the slopes of large drainages to the north, west, and south of the head of Ushk Bay. Several harvest units in these drainages would be visible to middleground views from small boats in the bay (eg. 2, 3, 4, 12, 40, 67, 68, and 75). However, because views in the drainages would be at oblique angles to the harvest units, and many of the units are located on relatively flat areas, visual impacts would be moderate and would meet the adopted Maximum Modification VQO for middleground views for the area. Except for the leading edges of two units (72 and 75), harvest units in the large drainage south of the head of Ushk Bay (15, 16-A, 37, and 77) would be unseen from the bay. Similarly, except for the leading edge of one unit (12), units in a drainage west of Ushk Bay (7, 10, 10-A, and 11) would be unseen.

One large harvest unit just north of the head of Ushk Bay (13) would be highly visible to foreground and middleground views from small boats in the bay. Because this unit is located above the shoreline with direct views, visual impacts would be high, and it would not meet the adopted Modification VQO for foreground views in the area.

Five harvest units along the south shoreline of Ushk Bay (40, 43, 55, 67, and 68) would be highly visible to foreground and middleground views from small boats in the bay. Two of the units (67 and 68) are adjacent to a proposed LTF site on the south shoreline of Ushk Bay behind a point that juts into the bay. Because these units are located above the shoreline with direct views, visual impacts would be high. These units would not meet the inventoried Partial Retention VQO; however, they would meet the adopted Modification VQO for foreground views in the area.

Alternative E

Alternative E proposes the largest number of harvest units dispersed in consolidated groups throughout VCUs 279, 280, and 281. This alternative would have the greatest overall effect on the visual resources of the Project Area. The harvest units along the north shoreline of Ushk Bay near the bay's mouth and along Peril Strait north of Poison Cove would be highly visible in the middleground to views from the Alaska Marine Highway ferry route. Timber harvest in these areas would result in high and moderate visual impacts to small boaters in the bays and ferry travellers in Peril Strait. Harvest units in several large drainages in Ushk Bay, Poison Cove, and Deep Bay would cause visual impacts similar to those described for the other alternatives.

The simulations in Figure 4-7 illustrate the visibility of timber harvest units, LTFs, logging camps, and roads under this alternative as they are predicted to appear when viewed from the two selected viewpoints.

VCU 279 - Visual impacts in the two large drainages west of Poison Cove would include all of the impacts described under Alternative B for this VCU. Alternative E would compound the visual effects in this area by adding seven harvest units to the slopes above Peril Strait (48, 49, 51, 58, 59, 66, and 104). Because views of these units would be direct, they would cause high visual impacts to foreground views from small boats and middleground views from the ferry route. Timber harvest units on these slopes would not meet the inventoried or adopted Partial Retention VQO for the area.

One harvest unit (105) on the slope above the south shoreline, would be highly evident in the foreground to views from the ferry, causing high visual impacts to ferry travellers. The ferry turns northeast in this area, and views toward the Project Area tend to be of longer duration than other views in the area. This unit would not meet the inventoried Retention VQO or adopted Partial Retention VQO for foreground views in the area.

The visual impacts of several harvest units in a drainage south of Poison Cove (110, 116, 117, 118, and 119) would be the same as described under Alternative C.

Two harvest units on the slopes south of the mouth of Deep Bay (26 and 26-A) would be highly visible in the foreground to views from the ferry route in Peril Strait. These units

Figure 4-7
Simulations - Alternative E

Viewpoint #1

Viewpoint #2

would cause high visual impacts to ferry travellers and small pleasure boaters in Peril Strait and would not meet the inventoried Retention VQO or adopted Partial Retention VQO for foreground views in the area.

VCU 280 - The visual impacts of harvest units in the large drainages west of Poison Cove that extend into this VCU from VCU 279 would be the same as described under Alternative B. The visual impacts of the first several harvest units located in the main drainage at the head of Deep Bay (21, 21-A and 23) would be the same as described under Alternative C.

In addition, two harvest units (25 and 25-C) located high on the slopes south of Deep Bay would be visible in the foreground from Deep Bay and in the middleground from Peril Strait. Although these units are relatively small and would be viewed mostly at oblique angles, they would be quite evident on the steep slopes and would cause high visual impacts. These units would not meet the inventoried Retention VQO or adopted Partial Retention VQOs for foreground views in this scenic area.

VCU 281 - Although some of the harvest units in the large drainages west and south of the head of Ushk Bay would be somewhat larger, visual impacts in this VCU would be the same as described under Alternative B. Visual impacts for the rest of the VCU would be the same as described for Alternative C, except under this alternative the harvest units along the north shoreline of Ushk Bay would be larger and extend to the mouth of the bay. Overall, Alternative E would cause higher visual impacts to views from small boats in Ushk Bay and the ferry route in Peril Strait than other alternatives.

The harvest units along the north shoreline of Ushk Bay (2, 3, 93, 94, 95, and 96) would be highly visible to foreground views from small boats entering this popular bay and would cause high visual impacts. Two of the units (95 and 96) would also be visible to middleground views from the ferry route. These units would cause high visual impacts and consequently not meet the inventoried Partial Retention VQO. However, they would meet the adopted Modification VQO for foreground views in the area.

Alternative F

Alternative F comprises groups of timber harvest units consolidated mainly in the large drainages of Ushk Bay, Poison Cove, and Deep Bay. The majority of the timber harvest in this alternative would occur in VCU 281. Although timber harvest activities would occur in all three VCUs in the Project Area, only a few of the Poison Cove units would be visible from Peril Strait. Harvest units in Ushk Bay would be highly visible from small boats entering the bay for recreational activities. The first few harvest units in Deep Bay would be visible to small boats (e.g. 21, 21-A).

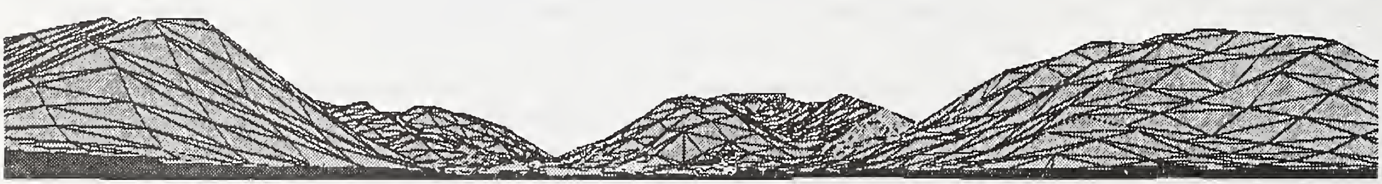
The simulations in Figure 4-8 illustrate the visibility of timber harvest units, LTFs, logging camps, and roads under Alternative F as they are predicted to appear when viewed from the two selected viewpoints.

VCU 279 - Visual impacts in the two large drainages west of Poison Cove would be the same as described under Alternative B for this VCU.

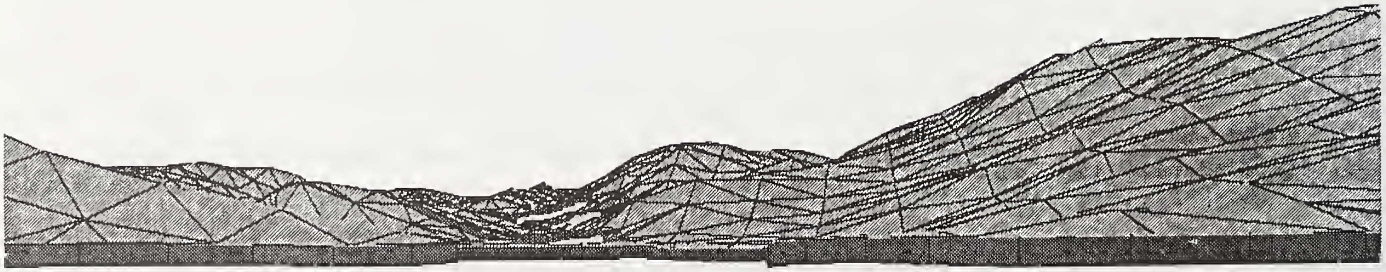
VCU 280 - The visual impacts of harvest units in the large drainages west of Poison Cove that extend into this VCU would be the same as described under Alternative B for this VCU. The visual impacts of the first several harvest units (21, 21-A and 23) located in the main drainage at the head of Deep Bay would be the same as described under Alternative C.

VCU 281 - Visual impacts in this VCU would be the same as described under Alternative B.

Figure 4-8
Simulations - Alternative F



Viewpoint #1



Viewpoint #2

Evidence of previous log handling in the project area/ Poison Cove.

Log Transfer Facilities and Logging Camps

Ushk Bay - There are two alternative LTF locations in Ushk Bay. The one proposed under Alternatives B, C, and D is located on the south shoreline on the west side of a point that juts into the bay obscuring views from small boats until they round the elbow of the bay. This bulkhead and A-frame LTF would be openly visible to foreground and middleground views from small boats in the head of Ushk Bay, a popular anchorage for day and overnight recreational users. Although the LTF would not be seen from the Alaska Marine Highway ferry route, it would be highly visible from anchorages in Ushk Bay and would result in high visual impacts.

The other LTF in Ushk Bay, proposed in Alternative E, would be located on the north shore nearer the mouth of the bay. Although the LTF could possibly be seen from the Alaska Marine Highway ferry route and all other boat traffic using Peril Strait, it would be in the middleground and background views and would be a drive-down ramp. The proposed site would be less visible to the popular anchorage for day and overnight users.

Neither of the two LTFs would meet the inventoried Partial Retention VQO of the surrounding landscape, but they would meet the adopted Maximum Modification VQO in the revised TLMP for middleground views in the area. The anticipated impacts from the North Ushk LTF would be greater than the impacts from the South Ushk LTF to viewers on the Alaska Marine Highway. This is because of the heavy equipment and greater possibility of viewers perceiving the changes to natural landforms, although the LTF may not actually be seen. Most of these impacts can be offset through the use of screening vegetation, native rock to blend edges, and tapering edges to permit the appearance of more natural landforms.

Poison Cove - There are two alternative LTF locations in Poison Cove. The one proposed under Alternatives B, E, and F would be a drive-down ramp located on the south shoreline at the mouth of the cove, highly visible to middleground views from the Alaska Marine Highway ferry route through Peril Strait. The visual contrasts of the floats, log storage, sort yard, and camp in this area would cause high visual impacts to views from ferry travellers and small pleasure boaters in Peril Strait. The location would also be openly visible to foreground views from small boats entering Poison Cove.

The other LTF site in Poison Cove, proposed under Alternatives C and D, would be located on the outer edge of the mouth on the north shoreline of the cove. Similar to the site on the south shoreline, this location would be highly visible to middleground views from the ferry route in Peril Strait. Further, the road system to this site would create additional visual contrasts, increasing the impacts to views seen by ferry travellers and small pleasure boaters.

Because both of these LTF locations would be highly visible from Peril Strait, they would not meet the Partial Retention VQOs of the surrounding landscape. Further, it would be difficult for either site to meet the adopted Modification VQO for middleground views in this area, although the south shore LTF would come closer to meeting this VQO.

Peril Strait (Goal Creek) - Located south of Poison Cove on Peril Strait, this LTF would be highly visible to foreground views from the Alaska Marine Highway ferry route. Similar to the LTF sites in Poison Cove, visual contrasts caused by an LTF, heavy equipment, etc. in this area would result in high visual impacts to ferry travellers and small pleasure boaters in the strait.

Where visible from Peril Strait, this LTF would be not meet the inventoried Retention VQO of the surrounding landscape, nor the adopted Partial Retention VQO for foreground views in this area.

Deep Bay - Proposed under Alternatives C and D, this LTF would be located on the south shoreline, about halfway along the bay. Because the site is openly visible to foreground and middleground views from small boats entering the bay, a popular anchorage for day and overnight recreational users, it would cause high visual impacts to recreational users of the bay. However, the islands at the mouth of the bay would screen the location to most views from the Alaska Marine Highway ferry route in Peril Strait.

This LTF location would be highly visible from anchorages in Deep Bay, and would not meet the Retention VQO of the surrounding landscape, nor would it meet the adopted Partial Retention VQO for foreground views in the area.

Comparison of Alternatives

Road construction and timber harvest would be visible from the Alaska Marine Highway route in Poison Cove in all the action alternatives. Alternatives B and F would harvest the fewest acres in VCU 279 and would cause the lowest visual impacts to views from the ferry route among the action alternatives. Harvest units on the slopes above Peril Strait and in the Goal Creek area in Alternatives C and E would cause the most substantial change to views from the ferry route and small boats. Although under Alternative C harvest would be by group selection, the overall visual effect to views from the ferry route would be less, but would approach Alternative E because of the large extent of the group selection units.

All of the action alternatives would result in substantial visual change to views from small boats in Ushk Bay with the dispersed harvest units under Alternative D having the least impact, Alternatives C and E having the most impacts, and Alternatives B and F falling in between.

Cumulative Effects and Regeneration

Visual impacts are most significant from one to five years after timber has been harvested when color changes in slash, stumps, and debris become more dominant. In the foreground views (up to 1/2 mile), activities associated with road construction (e.g., cut-and-fill slopes, rock pits, and turnouts) are readily visible to the casual observer. As seen in the middleground (1/2 to 3 miles), the distinct texture and colors of mature forest is broken by harvest units.

Approximately 321 acres of VCU 281 has been previously harvested. The few previous harvest units in this VCU are relatively small in size and occur mostly along the shoreline of Ushk Bay. One of the most recent harvest units is on the south shoreline of Ushk Bay. Previous harvest also occurred near the head of the bay. Mature alder has overgrown the access road beds, and harvest unit boundaries are no longer evident to the casual forest visitor. Other previous harvest in the Ushk Bay area (VCU 281) occurred in very small units in several places along the shoreline of the bay. The most visible units are on the south shore of Ushk Bay and in the drainage west of Point Marie. These areas are partially regenerated with spruce-hemlock forest approaching pole size.

Previous modifications to the landscape also exist in VCU 279, in the Poison Cove Area, where some selective harvest occurred in the forest around this small bay. In addition, there is a small cabin on the north shoreline, and this bay is frequently used to store log rafts waiting for high tides before passing through the Peril Strait Narrows. Other than the cabin and log rafts, changes in the landscape are generally unnoticed by the casual observer.

Maximum Distrubance Threshold

In order to meet the intent of VQOs, the Tongass National Forest has established the amount of disturbance allowed over an approximately 20-year period in any given area as the maximum disturbance threshold (MDT) for each VQO:

VQO	Maximum Disturbance Threshold
Retention (R)	No more than 8 percent of the area may be in a disturbed condition at any one time.
Partial Retention (PR)	No more than 16 percent of the area may be in a disturbed condition at any one time.
Modification (M)	No more than 25 percent of the area may be in a disturbed condition at any one time.
Maximum Modification (MM)	No more than 35 percent of the area may be in a disturbed condition at any one time.

The 20-year period is the time required for trees in regenerating harvest units to grow to 30 feet in height, the mimimum height generally needed to blend into a continuous textured landscape. MDT is used primarily in evaluating the cumulative disturbance, or change, in the landscape over time. Typically, the acres of proposed harvest units are combined with acres of existing harvest units and displayed as a percentage of the total acres of a particular VQO within a VCU. This percentage is compared to the MDT to determine the potential cumulative visual impacts in a given area.

Because the areas of previous timber harvest in the Ushk Bay Project Area are relatively small areas and have regenerated with trees near or over 30 feet in height, the total acres of disturbance would be the same as the acres of proposed harvest units in Alternatives B-F (action alternatives). As shown on Table 4-46, a comparison of the MDT for each VQO with the total acres of proposed harvest units in each alternative, none of the alternatives are expected to exceed the MDT for any VQO in any VCU.

Table 4-46

Comparison of Maximum Disturbance Threshold with Expected Cumulative Visual Effects

VQO		Total in VCU	A	B	C	D	E	F	Maximum Disturbance Threshold
VCU 279									
Retention	*Acres*	1,703	0	0	81	30	37	0	136
	Percent	23	0	0	5	2	2	0	8
Partial Retention	*Acres*	4,836	0	139	718	242	461	139	777
	Percent	64	0	3	15	5	10	3	16
Modification	*Acres*	934	0	65	61	50	65	65	234
	Percent	12	0	7	7	5	7	7	25
Maximum Modification	*Acres*	33	0	10	10	1	10	10	12
	Percent	1	0	30	30	3	30	30	35
VCU 280									
Retention	*Acres*	714	0	0	25	38	41	0	57
	Percent	4	0	0	4	5	6	0	8
Partial Retention	*Acres*	7,200	0	200	319	153	295	201	1,152
	Percent	43	0	3	4	2	4	3	16
Modification	*Acres*	4,881	0	47	69	13	74	52	1,220
	Percent	30	0	1	1	<1	1	1	25
Maximum Modification	*Acres*	3,901	0	79	345	225	347	344	1,365
	Percent	23	0	2	9	6	9	9	35
VCU 281									
Retention	*Acres*	1,359	0	2	4	2	4	2	109
	Percent	7	0	<1	<1	<1	<1	<1	8
Partial Retention	*Acres*	12,015	0	771	1,299	595	1,170	771	1,922
	Percent	59	0	6	11	5	10	6	16
Modification	*Acres*	6,570	0	529	699	331	709	539	1,643
	Percent	32	0	8	11	5	11	8	25
Maximum Modification	*Acres*	357	0	0	51	0	51	0	125
	Percent	2	0	0	14	0	14	0	35
Project Area Acres		44,503	0	1,842	3,681	1,680	3,264	2,123	

Regeneration of spruce-hemlock forest begins soon after harvest has occurred. As harvested areas regenerate, their appearance goes through several stages:

Year 1 to 2 - In the first couple of years color changes of dying stumps, branches, and needles tend to increase visual impacts. When the branches and needles of harvested trees die, their color changes to reddish-brown resulting in higher color contrasts with the dark greens of the surrounding forest. This, and the lighter color of lower limbs of adjacent stands, tend to dominate the visual setting. Further, stumps and larger debris tend to weather and lighten, adding to color contrasts. As stumps, debris, and needles decay, the light greens of low vegetation (e.g., ferns, mosses, etc.) begin to dominate, somewhat reducing the color contrast.

Year 5 - Regeneration of the new forest begins with low vegetation (e.g., berry bushes, ferns, etc.). Alder will often invade disturbed areas like roads, rock pits, storage areas, and sort yards. The visual effects of clearcuts remain evident in the foreground, but shrubby vegetation and young trees begin to cover the stumps and exposed ground. Harvest units also remain evident with sharp contrasts in color and texture in the middleground.

Year 5 to 20 - Young trees establish themselves, reaching a height of approximately 15 feet. At the end of twenty years, forest visitors would see healthy, thinned stands of spruce and hemlock with some yellow cedar in foreground views. The precommercial thinning process would create a well defined stand. For middleground views, the contrast between new and mature forest would still be quite evident.

Year 50 - The new forest reaches a height of up to 50 feet. Viewed in the middleground, regenerating stands would be appear to be approximately half the height of mature stands. If harvested areas were entered again and new harvest units were adjacent to the 50-year stand, the visual effect would be a less obvious transition between regenerating stands, the new harvest unit boundary, and mature stands. By the end of fifty years, the canopy of regenerating stands is closed and the new forest appears dense.

Year 80 - Regenerating stands reach 75 percent of their mature height. The distinction between regenerating stands and adjacent mature forest is less apparent in middleground views. The canopy appears full with tree crowns and little space for understory vegetation to establish. In the foreground, trees are of large diameter and visibly dominant when viewed from roads. The canopy is visible at approximately thirty feet from the forest floor.

Year 100 - The distinction between the 100-year-old forest and adjacent overmature forest is no longer evident. Stands reach approximately 100 feet in height and appear healthy and lush, with full canopies. In foreground views, the regenerated forest is extremely dense, with little light reaching the forest floor. Selective harvest or small group selection may be needed around recreation roads to allow additional sunlight for safety purposes or increased vista opportunities.

Economic and Social Environment

This section describes the potential effects the Ushk Bay Project would have on the economic and social components of the environment. The discussion begins with a quantitative analysis performed for the Ushk Bay project. The discussion then continues with a description of the project's quantitative impact, and an analysis of the effect of this impact on the regional economy, population, and society.

Quantitative Analysis

The economic forecasting model Micro IMPLAN (IMpact PLANning) was used in the quantitative economic and social effects analysis of the Ushk Bay Project. The analysis area was considered to consist of the Sitka and Juneau boroughs, and the Skagway-Yakutat-Angoon and Wrangell-Petersburg Census Districts. The IMPLAN model's database was based on 1990 demographic and economic values (based on estimates by the Census Bureau and the Bureau of Economic Analysis of the U.S. Department of Commerce). The total population of the four districts in that year was 46,800, of whom 31,164 were employed. The Gross Regional Product of the region (total value of new goods and services produced that year) was $1.194 billion (IMPLAN 1992).

The IMPLAN model works on the basis of monetary transactions between different economic sectors including agriculture, forestry, mining, construction, manufacturing, utilities, trade, services, and government. If a sector experiences a change in demand for its output, it must alter its inputs to accommodate that change. This sets off compensating changes in the sectors doing business with the first sector, including changes in payrolls, profits, rents, and other income. The changes in income ripple out through the economy as residents, over time, alter their consumption patterns in response to changes in their income streams. IMPLAN estimates the multiplier effects of a change in one sector's demand on the rest of the regional economy. The effects are described in terms of direct, indirect and induced changes in income, employment and output. Using a timber harvest project as an example of an initial action which would have broad economic effects, the difference between these different types of changes can be illustrated. Direct changes are those directly experienced by industries in the first sector, such as logging operations, pulp mills, and sawmills. Indirect changes are those experienced by suppliers to the first sector, such as machinery, equipment, and fuel suppliers. Induced changes are those which affect the rest of the economy via shifts in population spending patterns. These variations occur as a result of changes in wages and other income, which in turn are a result of the direct and indirect changes in industrial output and employment caused by the initial action. Collectively, the indirect and induced changes that follow a direct effect are called the secondary effects. These secondary effects, together with the direct effects give the total effect or impact of the given action.

Economic Environment

A comparison of the direct and total effects of the various alternatives indicates the relative magnitude of the multiplier effects of the proposed actions. The results of the IMPLAN analysis for the Ushk Bay Project, showing both direct and secondary effects, are summarized in Table 4-47. As shown, Alternative E is forecast to have the largest economic effect due to the fact that it would produce more timber than any of the other four action alternatives. Over the period required to produce and process the 90.3 million board feet of timber called for in Alternative E, 411 people would be employed in the three end-use industries plus construction of the specified roads in the Ushk Bay Project Area. Direct worker compensation would amount to $15.53 million over the harvest and production period, and the value added from the production would contribute $23.07 million to the Gross Regional Product.

Table 4-47

Regional Economic Impacts, by Alternative[1]

Alternative	Parameter	Direct Effects	Secondary Effects	Total Effects
B	Jobs	257	33	290
(50.6 MMBF)	Employee Compensation	9.34	0.89	10.23
	Gross Regional Product	14.01	1.52	15.53
C	Jobs	386	92	478
(84.8 MMBF)	Employee Compensation	14.59	2.29	16.88
	Gross Regional Product	21.67	3.94	25.61
D	Jobs	245	54	299
(46.5 MMBF)	Employee Compensation	8.97	1.32	10.29
	Gross Regional Product	13.51	2.27	15.78
E	Jobs	411	98	509
(90.3 MMBF)	Employee Compensation	15.53	2.44	17.97
	Gross Regional Product	23.07	4.21	27.28
F	Jobs	290	69	359
(62.4 MMBF)	Employee Compensation	10.81	1.70	12.51
	Gross Regional Product	16.10	2.95	19.05
Regional Totals[2]	Jobs			31,164
	Employee Compensation			823.93
	Gross Regional Product			1,194.07

Sources: Assam and Mott, 1993; IMPLAN 1992, 1993.

[1] Employee Compensation and contribution to Gross Regional Product in millions of 1990 dollars. Impacts are multi-year and represent cumulative total values over durations of alternatives.

[2] Regional totals are included for comparison. Data includes 1990 figures for the Sitka Borough, Juneau Borough, Skagway-Yakutat-Angoon Census District, and the Wrangell-Petersburg Census District.

These direct effects would support secondary rounds of spending and consumption which would have a multiplier effect on incomes, employment and output. As shown in Table 4-47, an additional 99 jobs in indirect and induced employment would also be generated. These jobs would be mainly divided among the logging, trade and services sectors of the regional economy. The compensation for these secondary jobs would amount to $2.44 million, and the Gross Regional Product would gain an additional $4.21 million with Alternative E. The employment multiplier would amount to 1.24, i.e., for every one direct job in the end use forest commodity and road construction industries, another 0.24 secondary jobs would be generated elsewhere in the regional economy. The model includes effects that are a result of the value of goods and services consumed but not produced in the region, i.e., the things that have to be imported to meet local demand. As a result of Alaska's low level of manufacturing, a substantial fraction of the gross regional product is composed of markups of wholesale and retail goods brought in from outside the region.

Without the effect of the specified road construction and variations in haul/dump and towing costs, the model's results would be linear with varying volume of timber harvest. Since the cost of these factors do not vary linearly with the amount of logging, however, the differences among the action alternatives are not precisely proportional to harvest volume. In descending order of magnitude, the action alternatives are ranked as follows, in terms of percentage of Alternative E's total employment effects:

- Alternative E: 100.0%
- Alternative C: 93.9%
- Alternative F: 70.5%
- Alternative D: 58.7%
- Alternative B: 57.0%

As noted earlier, the direct effects trigger the secondary (multiplier) effects. The spreading and expansion of economic activity among the non-direct economic sectors is due to enterprises and individuals using savings or borrowed funds to expand their consumption, and due to investment activities which occur in response to the stimulus of the direct activity. Eventually the stimulus is dissipated through leakages of spending outside the regional economy, and limits on persons' propensity to spend income gains.

It is important to take into account the extent to which the proposed action could add to the ongoing level of economic activity in Southeast Alaska. If workers and other resources are already fully employed, then carrying forward the proposed timber harvest would produce a real expansion of the regional economy. However, if the activity would only carry forward an existing level of harvesting, then the effects on jobs and income should be considered as maintaining or sustaining the present level of economic activity. If the latter is the case, then the No-Action Alternative A would have negative economic impacts on the region, the magnitude of which would be on the order (in the negative) of one or another of the proposed action alternatives' effects.

Commercial Fishing Industry

The Ushk Bay Project is expected to have limited adverse effects on the commercial fishing industry of Southeast Alaska. Under all of the action alternatives some fish habitat may be lost due to stream and watershed alterations resulting from road construction and logging activities (Bjerklie and Reub 1993). The effect of this habitat loss on the regional commercial fishing industry is expected to be quite small. In any event, habitat loss impacts would be kept to a minimum by the use of site specific mitigative measures (Bjerklie and Reub 1993). No loss of fish habitat, and no substantial adverse effect on the Southeast Alaska fishing industry is expected under the No-Action Alternative of this project. Dependent on several other economic factors, the local commercial fishing industry may be affected by the negative ripple effects of the No-Action Alternative, with the general slowdown in the local economy this alternative is expected to bring.

Recreation and Tourism Industries

The recreation and tourism industries in Southeast Alaska are expected to experience limited adverse effects from activities in the Ushk Bay Project Area. The visual experience obtained by passengers traveling past the Project Area by air and by water may be diminished due to the presence of forest management operations. Competition for recreation space could occur in areas adjacent to the Ushk Bay Project Area, as access to formerly open areas is modified by logging activities. This latter impact is expected to last for the duration of project. Upon project completion, improved access due to forest management operations would likely encourage recreational use of the Project Area. No substantial adverse effects on the Southeast Alaska recreation and tourism industries are expected as a result of the No-Action Alternative of this project. Dependent on several other economic factors, local recreation and tourism industries may be affected by the negative ripple effects of the No-Action Alternative, with the general slowdown in the local economy this alternative is expected to bring.

Timber Industry

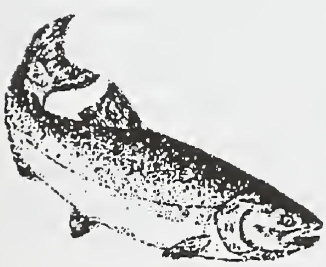
The Ushk Bay Project would have the greatest favorable effect on the Southeast Alaska Timber industry, more than any other industry in the region. Either Alternative C or E would fulfill the project objective of obtaining approximately 89 MMBF of timber. Direct and secondary employment created by these alternatives would act more to sustain current employment levels, than to cause these levels to increase. Alternatives B, D, and F all fall short of the 89 MMBF project objective by varying degrees. The No-Action Alternative would have a substantial adverse effect on the Southeast Alaska timber industry. Under this alternative, without a timber harvest from some other area, sawmills that rely on a steady timber supply may be forced to cut back production or close. Such a situation would result in substantial direct and secondary employment losses in the region.

Social Environment

In addition to changes in employment, income, and other economic effects, implementation of each of the alternatives will have an effect on the social environment. These effects are described in the following sections on population adn on lifestyles and community stability.

Population

Population changes in most areas of Alaska are greatly influenced by the availability of economic opportunities. The population of many areas often experience wide fluctuations associated with the rise and fall of economic activity. While many areas of Southeast Alaska have historically been at least partially immune to such large population fluctuations, they still do occur in this area, though on a smaller scale. The frequency of these fluctuations is often high enough that many communities have experience in dealing with them, and often have institutionalized into their social structures the capacity to adapt to these swings in population.



The Ushk Bay Project is not expected to have a dramatic effect on the size, demographic makeup, or growth trends of the Southeast Alaska population. This is in part due to the fact that the five action alternatives put forth in this study are designed to maintain, to some degree, the existing level of timber harvest in the Chatham Area. Under the No-Action Alternative, without timber harvest from another area, the sawmills dependent on a steady timber supply may be forced to slow down production or close Under this scenario, a negative ripple effect would spread out across the various economic sectors in Southeast Alaska that indirectly benefit from the employment generated by the affected mills. This would likely result in a slower or possibly negative population growth in some area communities.

Lifestyles and Community Stability

The lifestyles, values, and economic pursuits of the residents of Southeast Alaska are very diverse. Consequently National Forest timber sale projects have historically had a variety of positive and negative effects on local communities. To communities dependent on the timber industry, these projects may be seen as beneficial to their way of life, with the guarantee of continued employment for their residents. To other communities more dependent on subsistence gathering, these projects may act as hindrances to the day-to-day lives of their residents.

The Ushk Bay Project may have an adverse effect on local subsistence and recreation patterns, mainly due to wildlife habitat modification, enhanced or restricted access, changes to the visual and aesthetic character of the area, and new competition from outsiders. Conversely, the Ushk Bay Project is just as certain to have a favorable effect on the local economy, especially the timber industry, with its promise of continued employment and the overall economic stability that this activity would generate. In the ideal situation, a balance would be set up between the commodity (e.g., timber) and the non-commodity (e.g., subsistence and recreation) resource uses of the Tongass National Forest. In this way the chosen lifestyles of area residents, and the social and economic stability of communities in the region would be maintained.

The No-Action Alternative (Alternative A) would preserve the non-commodity resources of the Project Area, i.e., subsistence and recreational values. However, without timber from some other area, this alternative may force sawmills that rely on a steady timber supply to cut back production or close. This would have a substantial adverse effect on the lifestyles of many area residents, and the stability of many communities in the region would be disrupted. Conversely, Alternative E would place a large portion of the Ushk Bay Project Area under intensive forest management. This may have a substantial adverse effect on the area residents that utilize the area for recreation, subsistence, and other uses that require a more natural setting. Alternatives B, C, D, and F are, each to a varying degree, more balanced between intensive timber management and non-commodity uses of the Ushk Bay Project Area. These action alternatives would be more moderate in their overall impact to the lifestyles of local residents, and the stability of area communities.

Economic Efficiency

The current Forest Service handbook direction (USDA FSH 2409.18) requires an economic efficiency assessment to compare benefits and costs of proposed timber sale projects (known as the midmarket assessment) to determine if the sale would be an economic offering. This assessment was conducted by subtracting estimated logging and transportation costs (including road construction) from the pond log value for each action alternative. Pond log values represent an average market value for wood products net of the average manufacturing cost for those products. In order to account for market fluctuations, the weighted average of quarterly pond log values from 1981 through 1991 was used in the analysis. The middle market value, by species, was used for Ushk Bay pond values. The middle market is the timber market value where one-half of the timber volume was harvested at a higher value and one-half was harvested at a lower value. An allowance of 60 percent of normal profit and risk also was included as a cost and subtracted from the middle market pond log values per USDA FSH 2409.18. The assessment, therefore, provided estimates of the value of the timber that would accrue under average market conditions. Stumpage values would be higher under better-than-average market conditions and lower under less robust circumstances.

The results of the mid-market assessment and relative ranking of each alternative are displayed in Table 4-48. It is important to recognize that these values represent very preliminary approximations made at the time of the Notice of Intent, and that actual offerings are not based on this assessment. Prior to the time the timber is made available, a timber cruise and appraisal will be conducted using current selling values, costs, and normal (100%) profit and risk to determine the volume and value of timber made available for harvest.

Variances in volume per acre, species mix, logging systems, log-haul distance, road construction and reconstruction costs, camp mobilization costs, and profit and risk allowances affect both the pond log values for each alternative and the logging and transportation costs. Costs and revenues used in the assessment represent averages for each alternative. Although individual units may not be economical to harvest by themselves, the management of less productive lands or lands containing a high percentage of defective timber will help to increase future timber yields. The harvest of units with higher returns will help compensate for those that are less economical.

Based on this preliminary analysis, no alternative would result in positive stumpage values at a mid-market level and provide cash receipts to the government. The negative stumpage value indicated for Alternatives B, C, D, E, and F would probably result in establishment of ineffective purchase credit to be applied to other offerings.

Table 4-48

Economic (Mid-market) Assessment of Timber Harvest (in Dollars per MBF)

	Alternative					
	A	*B*	*C*	*D*	*E*	*F*
Volume (MMBF)	0	51	85	47	90	62
Pond Log Value	0	327	333	333	329	322
Stump to Truck Costs[1]	0	137	142	127	137	135
Transportation Cost[2]	0	44	42	42	43	54
Administration Cost[3]	0	12	12	12	12	12
Temporary Development[4]	0	36	34	32	31	37
Subtotal Logging Costs	0	230	229	212	223	237
Specified Road Costs[5]	0	59	67	122	66	64
Total Harvest Costs	0	289	296	335	289	301
Profit & Risk Margin	0	53	53	53	53	53
Net Stumpage Value[6]	0	(14)	(17)	(55)	(12)	(32)
Relative Ranking	Null	2	3	5	1	4

Source: Smith 1993.

[1] Includes falling, bucking, yarding, sorting and loading costs.

[2] Includes road haul, dump, raft, water tow and road maintenance costs.

[3] Includes Logging operations and overhead costs.

[4] Includes temporary road and camp mobilization costs, and LTF construction costs.

[5] Includes specified road construction.

[6] Net Stumpage = Pond log Value less total harvest costs less profit and risk

( ) Negative values.

The major factors affecting net stumpage values among the action alternatives are transportation costs (hauling) and the cost of specified roads. Alternatives with longer average haul distances and more miles of costly specified road construction yield the lowest net stumpage values. There is a direct relationship between the extent of helicopter yarding proposed for an alternative and increases in stump-to-truck costs. Generally however, the cost increases are more than offset by lower costs for hauling and road construction costs.

Pond log values used in the mid-market appraisal are shown in Table 4-49. Indicated also are the current pond values and net stumpage values by alternative. The current stumpage values reflect an allowance for full profit and risk, rather than 60 percent as is used in the midmarket process. Current pond values would result in economical offerings under all alternatives, and the current trend in pond log values is strongly upward.

Receipts and Payments

Annual payments are made to the State of Alaska from funds collected through the Tongass National Forest timber program. With few exceptions, 25 percent of all funds received by the program (including purchaser road credits) is paid to the State. The State in turn uses these funds for public schools and public roads in the region. The total value of funds contributed

Table 4-49

Comparison of Current Pond Log and Net Stumpage Values and Those Used in the Mid-market Appraisal

	Alternative				
	B	*C*	*D*	*E*	*F*
Mid-market Pond Log Value	$327.26	$332.62	$332.71	$329.37	$321.55
Current Pond Log Value	$375.26	$379.05	$384.98	$386.74	$365.51
Current Indicated Net Stumpage Value	14.10	11.64	(15.01)	26.38	(3.63)

in the past, however, has not comprised a significant portion of the total public school and public road budgets, for the cities and boroughs of Southeast Alaska (USDA Forest Service 1990).

While it is not possible to easily determine by alternative the relative payments that would be made to the State of Alaska with the Ushk Bay Project, the relationship of these payments to the harvest volume is approximately linear. Consequently, Alternative E with the largest harvest volume would likely contribute the largest amount to the State, and Alternative D with the smallest harvest volume would contribute the smallest amount. Alternative A, with no harvest volume, would result in no contributions to the State of Alaska.

Cumulative Impacts

The cumulative impacts of a timber sale project, such as the Ushk Bay Project, on the social and economic environment are difficult to estimate. The interaction of past, present and future actions in the Chatham Area, with the currently proposed actions in the Ushk Bay Project Area yields several incremental effects which are almost impossible to predict. Factors influencing these equations include Southeast Alaska population, lifestyles, community stability, employment, income, receipts, and the health of the overall local economy. Also having an influence on the local environment, are economic activities far removed from Southeast Alaska, such as those in other parts of Alaska, Canada, in the rest of the United States, and in the Pacific Rim. These components all interplay in complex ways to ultimately determine which direction the society and economy of Southeast Alaska will take.

From the standpoint of maintaining acceptable levels of employment, personal income, population, community services and stability, there is a substantial benefit to maintaining timber harvest in the Ushk Bay Project Area. Timber harvesting activities provide a substantial economic benefit, in generating revenue to the U.S. Treasury, payments to the State of Alaska, state and local taxes, and secondary spending in the local economy. While the Ushk Bay Project Area may not necessarily be a major component of the timber harvest industry, it is nevertheless a component of that entity. Under the Tongass Land Management Plan, the Ushk Bay Project Area was allocated for timber harvest, and as such, the Ushk Bay Project plays a role in ensuring the continuance of these social and economic benefits.

Unavoidable alteration of the natural environment occurs when roads and associated logging facilities are constructed, and timber is harvested. Much of the economic and social value of Southeast Alaska is based on its abundance of natural resources. With the passage of time, as more of the Tongass and other public and private lands are converted from natural conditions to managed forests, activities dependent and values attributed to the natural state of the forested land would become adversely affected. Such activities would be displaced by the Ushk Bay Project, and would ultimately be restricted to smaller areas.

Land Ownership and Use

Under Alternative A, the No-Action Alternative, land in the Project Area would remain in its present condition. No timber harvest would occur, and no roads, LTFs, or logging camps would be built.

Each of the action alternatives (Alternatives B-F) would alter existing environmental conditions of the Project Area as a result of timber harvesting and construction of roads, LTFs, and logging camps. Although the action alternatives offer different options on the degree and location of effects (see Chapter 2 of this EIS), some effects will be unavoidable.

Direct Effects

The Ushk Bay Project Area contains mostly National Forest lands whose use is designated by the TLMP and administered by the Forest Service. Two parcels of land in the Project Area, however, have been conveyed to private ownership in accordance with the Alaska Native Allotment Act of 1906 (ANAA). A 4.35-acre parcel was conveyed to the heirs of Mr. Charles Benson in 1969. This parcel, located on the north side of Poison Cove would not be directly affected by any of the proposed alternatives.

A second parcel of land was conveyed under the ANAA to Mr. Herman Kitka in 1979. A 4.14 acre parcel has been officially conveyed; an additional 155.86 acres is being considered for conveyance. No additional land conveyances or withdrawals are expected in the Project Area.

Under each action alternative, land will be used for roads, logging camps, LTFs, and associated timber harvest activities. Alternative B proposes two independent road systems that link timber harvest areas in the northern section of the Project Area with LTFs located at Ushk Bay and Poison Cove. This alternative would have no direct impacts on private landowners.

Alternatives C and D both allow timber harvesting in the southern portion of the Project Area. Both propose a remote LTF on the south side of Deep Bay with docks, equipment storage, and service areas, and a road to transport the harvested timber to the LTF. Under Alternative C, the road would be constructed independent of the main road system, only accommodating logging traffic from harvest units directly adjacent to the road, or an estimated 7.9 MMBF of timber. Alternative D would connect the road to the main system, allowing part of the harvest to be transported to LTFs at other locations. The amount of timber transported to the Deep Bay LTF under Alternative D is estimated at 6.0 MMBF.

The road proposed under Alternatives C and D would traverse land claimed by Mr. Kitka. Although no harvest units are planned for this area, Mr. Kitka's land claim would be directly affected by construction and transportation activities associated with both of these alternatives. Approval from the landowner or condemnation would thus be required.

Although Alternatives E and F include the same harvest units in the southern portion of the Project Area as Alternatives C and D, they do not propose an LTF at Deep Bay. Timber from these units would be transported by a road system to LTFs at either Ushk Bay (Alternative E) or Poison Cove (Alternative F). No harvest activities or road construction would occur within private lands and so no direct effects to landowners would be expected.

Indirect Effects

The proposed actions would cause indirect effects to both existing and potential recreational special use permittees. Operators of guide and charter services would probably relocate their services temporarily to areas removed from construction and harvesting activities. Some operators may be completely displaced from the Project Area because of disturbances from harvest-related activities.

It is difficult to define the areas actually used by holders of special use permits. Currently eight permit holders are authorized for guide and outfitter activities in the Project Area. Most focus on bear hunting. Other people reportedly use the area without authorization.

There have been no mining claims, withdrawals, administrative classifications, or rights-of-way identified in the Ushk Bay Project Area.

Subsistence

Effects on subsistence use of resources are evaluated below for each affected subsistence community. Use and effects on use are different for each resource and each community. The first resource evaluated is deer. It is one of the most important subsistence resources and much information is available for the evaluation. Following the evaluation of effects on subsistence use of deer are evaluations of effects on use of fish and shellfish, other wildlife, and other resources. The evaluation and findings for subsistence use required by ANILCA Section 810 conclude this section.

The most important subsistence item harvested from the Project Area is deer. According to the harvest records, more deer were harvested from the Project Area between 1988 and 1991 than all other resources combined. In addition, 97 percent of the deer harvested from the Project Area during this four-year period was taken by subsistence communities (this is the only distinction made in the records between subsistence and non-subsistence use). Over 90 percent of the deer harvested in the Project Area was taken by Sitka residents.

Subsistence Use of Deer

Communities Affected

Subsistence communities that have harvested deer from the Ushk Bay Project Area during the four-year period, 1988-1991 include Kake, Pelican, Petersburg, Rowan Bay, Sitka, and Wrangell (ADF&G 1992). Except for Sitka, the average number of deer harvested from the Project Area between 1987-1991 is one percent or less of their subsistence harvesting for each community. An average of approximately seven percent of the total deer harvested by Sitka residents came from the Project Area. Other subsistence communities (Angoon, Edna Bay, Haines, Hoonah, Port Protection, and Tenakee Springs [USDA Forest Service 1991c]) have reported using the Project Area for subsistence purposes in the past, but have not reported taking any deer during the five-year period for which data is available. Because of the distance of the communities from the Project Area, it is expected that the deer harvest for these other communities from the Project Area would be minimal.

The percentage of a given community's subsistence deer harvest that comes from the Project Area is small (seven percent for Sitka and one percent or less for other communities). Therefore, this small percentage of these communities' total deer harvest is that which would potentially be affected by timber harvest activities in the Ushk Bay Project Area.

Direct and Indirect Effects

The activities associated with the timber harvest may result in impacts on subsistence resource harvesting. These activities include harvesting of trees, which will reduce deer habitat capability in the Project Area; construction of logging roads and log transfer facilities (LTFs), which will change access; and maintaining a logging camp in the Project Area during the harvest operations, which will increase competition during that time for subsistence resources. Some of these activities may cause or allow additional changes that may result in further impacts. For example, the roads and LTFs may change the way the Project Area is used for hunting (by both subsistence and non-subsistence communities). Appendix H includes maps that show the parts of the Project Area used by nine subsistence communities and the activity areas for each alternative. Three communities (Kake, Pelican, and Rowan Bay) had no history of using the Project Area prior to 1987 and the extent of use for these communities has not been determined. The changes and their consequences are discussed below.

Access

Physical changes in access would primarily be increased access to the land. Existing subsistence hunting access (i.e., from the beach) would be decreased only very slightly during the active periods of the timber harvest under any of the action alternatives. Currently, no roads exist in the Project Area, as the few short roads in previous harvest areas have been overgrown by alders. Due to the steep slopes and dense vegetation without trails, access is somewhat limited to the interior of the Project Area. Previously, deer-hunting access has been entirely from the beach, and most deer harvest has been at or adjacent to the beach because of the difficulty of traveling into the interior of the Project Area on foot. New LTFs and road systems would allow ready access to interior hunting areas and to higher elevations. More of the deer population in the Project Area would be accessible to hunters during the late summer and fall, but this may or may not increase the total number of deer harvested during the year. It could simply change when the deer are harvested.

Some residents of Sitka, the closest community and most extensive user of the Project Area, use all-terrain vehicles (ATVs) while hunting (Ann Lowe, pers. comm.). To do so, they load ATVs onto skiffs and transport them to an access point, such as an LTF, and ride them on the logging roads to the hunting areas. They also use them to transport their harvested deer back to the skiff. ATV access could cause a shift away from traditional users to those who have or can afford ATVs.

The following discussion addresses how each action alternative would affect access to the Project Area. Logging roads will remain open during the timber harvest and no restrictions for access are expected during that time.

Alternative B proposes to construct 36 miles of logging roads and 2 LTFs. The LTFs at Ushk Bay and Poison Cove would each have a separate road system (not interconnected, i.e., the roads dead-end in the valleys). None of these roads extend into the open muskeg areas (deer summer range) at high elevations in the interior of the Project Area, but some of them approach summer range areas and make it more feasible to get there on foot in three places. About six miles of the roads at Ushk Bay are located near the beach fringe. This alternative does not propose to construct roads in the vicinity of Deep Bay, therefore, there would not be easy access to the interior of this area. The Road System Management Objective for this alternative proposes that the roads be closed after logging activities are complete. The effect on access for deer hunting will be small overall, and very small after the timber harvest is completed. Alternative B would have a land camp at Ushk Bay, which would discourage some people from using anchorage in Ushk Bay for hunting.

Alternative C proposes to construct 62 miles of logging roads and 4 LTFs. The LTFs at Ushk Bay, Poison Cove, Goal Creek, and Deep Bay would each have a separate road system (not interconnected, i.e., the roads dead-end in the valleys). None of these roads extend into the open muskeg areas (deer summer range) at high elevations in the interior of the Project Area, but some of the roads approach these areas and make it more feasible to get there on foot in five places. About 14 miles of the roads at Ushk Bay would be located near the beach fringe (from the shoreline to approximately 1,000 feet inland), as would over 2 miles of road at Deep Bay and about 2 miles at Poison Cove. The Road System Management Objective for this alternative proposes that the roads remain open after logging activities are complete. The effect on access for deer hunting will be moderate, both during the timber harvest and after it is completed. Alternative C would have a floating camp at Ushk Bay, which would discourage some people from using anchorages in Ushk Bay for hunting.

Alternative D proposes to construct 49 miles of logging roads and 3 LTFs. The LTFs at Ushk Bay, Poison Cove, and Deep Bay would have their roads interconnected. The interconnection between roads in the Ushk Bay drainage, those in the Deep Bay drainage, and those in the Poison Cove drainage would go over a saddle that is largely open muskeg and is connected to even higher elevation open areas. Altogether, the summer range may be directly accessible along about five miles of road and larger areas accessible on foot in four places. Therefore, the interior of the Project Area would be accessible from any one of the three LTF locations. About 9 miles of the roads at Ushk Bay would be located near the beach fringe, as would over 2 miles of road at Deep Bay and about 3 miles at Poison Cove. The Road System Management Objective for this alternative proposes that the roads remain open after logging activities are complete. The effect on access for deer hunting will be moderate, both during the timber harvest and after it is completed. The logging camp would be land-based, as in Alternative B.

Alternative E proposes to construct 65 miles of logging roads and 3 LTFs. The LTF at Ushk Bay would have the road connected over the pass to the Deep Creek drainage. The LTFs at Poison Cove and Goal Creek would each have an independent road system not connected to the Ushk Bay system. The interconnection between roads in the Ushk Bay drainage and those in the Deep Bay drainage would go over a saddle that is largely open muskeg and is not far from even higher elevation open areas. Altogether, the summer range may be accessible along more than three miles of road and more area accessible on foot in five places. About 11 miles of the roads at Ushk Bay would be located near the beach fringe, as would about 5 miles at Poison Cove. The Road System Management Objective for this alternative proposes that the roads be closed after logging activities are complete. The effect on access for deer hunting will be moderate during the timber harvest and small after harvest activities are completed and the roads are closed. Alternative E proposes a land camp at Poison Cove, which would have less effect on users of Ushk Bay.

Alternative F proposes to construct 47 miles of logging roads and a single LTF. The harvest units at Ushk Bay would be accessed by a road over the pass to the LTF at Poison Cove, and the harvest units in the Deep Bay drainage would also be connected with the road over the pass to Poison Cove. Access to the high elevation summer range would be available along more than five miles of road, and additional area would be accessible on foot in four places. About six miles of the roads at Ushk Bay would be located near the beach fringe, as would about one mile at Poison Cove. The Road System Management Objective for this alternative proposes that the roads be closed after logging activities are complete. The effect on access for deer hunting will be low to moderate during the timber harvest and small after harvest activities are completed and the roads are closed. Table 4-50 summarizes the information discussed for each alternative. Alternative F also proposes a land camp at Poison Cove similar to Alternative E.

It should be noted that the changes in access themselves may not translate to an effect on subsistence use. The roads will make access to the deer summer range easier for all hunters. Unlike some areas where the increase in road access has made the area increasingly attractive to hunters from non-rural communities, the Ushk Bay Project Area lacks several important features. The road system, even under the alternative with the most roads, does not connect to other roads or lead to a town or a notable recreation destination. It has no ferry connection, and the physical size of the access points at the LTFs will limit the number of users at one time. The Project Area will remain the same distance from other population centers, and it will have most of the constraints that cause the mix of users to be as it is before timber harvest. It is therefore reasonable to assume that the hunters who use the Project Area during and after the timber harvest will mostly come from the same communities as before and that the percentage of deer taken by subsistence hunters will remain about the same. Therefore, a connected road system will not redistribute hunters from one community into areas traditionally hunted by another community.

Competition

Competition for subsistence deer could be affected in three ways. First, during the timber harvest activities, the residents of the logging camp (most or all of whom are likely to have never hunted in the Project Area before) could be harvesting deer. Deer harvest for these people would be very easy because it would be near their home and they would have easiest access. Second, because of road access to the interior of the Project Area, some people may come to

Table 4-50
Access Effects Summary

Alternative	Road Miles	LTFs	Summer Range Road Miles	Summer Range Access Points	Beach Fringe Miles[1]	Road Management Objective	Access Effect[2]
B	36	2	0	3	6	closed	small
C	62	4	0	5	18	open	moderate
D	49	3	5	4	14	open	moderate
E	65	3	3	5	16	closed	moderate/small
F	47	1	5	4	7	closed	moderate/small

Source: Frostholm and Janis, 1993

[1] Number of miles within 1,000 feet of the shoreline

[2] Based on best professional judgement

the Project Area to hunt, either during the timber harvest period or after, who have never hunted there before, or some people may increase their hunting in the area. Third, some people who previously hunted there regularly may choose not to continue because of the changes brought about by the timber harvest. These changes may include the presence of the logging camp residents, the logging activities, road access, and the perceived reduction in deer availability in the usual places. In other words, people who choose their hunting area on the basis of the solitude and setting and those who cannot or will not change their ways of hunting in the Project Area to adapt to changes in access may choose to go elsewhere. There may be those who consider the Project Area to be part of their traditional hunting territory and will not adapt to changes in hunting territory because other areas may not be culturally or traditionally acceptable alternatives. Furthermore, because Ushk Bay is an important anchorage for hunts in Hoonah Sound and Deadman's Reach, people may choose not to hunt while the logging camp is present.

Competition From Logging Camp Residents. At least some of the timber workers and logging camp residents will compete for the deer in the Project Area during the timber harvest period. Some residents of the logging camp would be subsistence users, although it is possible that some camp residents would be Alaska nonresidents or non-rural community residents. To the extent that the deer harvest by camp residents qualifies as subsistence harvest, their harvest may replace the harvest of some other subsistence users, whether or not there is a change in the total subsistence use. The primary subsistence users of the Ushk Bay Project Area, those from Sitka, will be most affected by the competition from logging camp residents. In addition, the camp residents would have a competitive advantage over other hunters in the Hoonah Sound and Peril Strait WAAs due to their close proximity. This would only occur for the 3-5 years of timber harvest.

The type and location of the logging camp will vary among the action alternatives. Alternatives B and D would have a land-based camp at Ushk Bay. Alternative C would have a floating camp at Ushk Bay. Alternatives E and F would have a land-based camp at Poison Cove. The difference between a land-based and a floating camp as far as access to hunting is probably so small as to be inconsequential. However, there are differences among alternatives in ease of access and the amount of hunting area accessible, which might affect the level of competition from camp residents.

Under Alternatives B and C, logging camp residents at Ushk Bay would have direct access to only the road system in the Ushk Bay drainage. They could go by skiff to access roads at Poison Cove (both alternatives) and Goal Creek and Deep Bay (Alternative C only), but that

Proposed actions could affect the availability of wildlife for hunting and trapping.

would be an advantage over Sitka residents only because it is a shorter distance. Camp residents could easily make day trips to these other areas or arrive earlier, while Sitka residents would arrive later or have to stay overnight to use these areas.

Under Alternative D, logging camp residents at Ushk Bay would have access from camp via the interconnected road system to the Poison Cove and Deep Bay drainages as well as to the summer range areas between the drainages. Alternative F, with the camp at Poison Cove, would provide direct road access for camp residents to essentially the same areas as Alternative D.

Alternative E, with the camp at Poison Cove, would provide direct road access from camp to only the Poison Cove drainage. To access the Ushk Bay and Deep Bay road systems and the summer range between, residents would have to transport their road vehicles to the LTF at Ushk Bay. During the timber harvest activities, there probably would be work vehicles at the Ushk Bay LTF that could potentially be used for hunting without the need for anything more than a skiff ride from camp.

New Competition From Non-camp Residents. The newly available access to the interior of the Project Area will potentially be attractive to some hunters who have not previously hunted in the Project Area. Some of these may be non-subsistence hunters. However, as discussed in the previous section on *Access*, the hunters using the Project Area are expected to come from the same communities as before the timber harvest, so the percentage of non-subsistence hunters would not change. The alternatives that make this area most attractive to new hunters are those that make the most area accessible. Alternative D would be most attractive because it would have three LTFs for access to the road system, which would open all three major drainages and the summer range to deer hunters. Because of the amount of hunting area accessible from one landing point, Alternative F would be next most attractive, then Alternative E, then C, then B, as long as the roads are open. The Road Management Objectives planned for each alternative would have the road systems closed in all except Alternatives C and D. Therefore, in the longer term, Alternative D would have the maximum effect on competition from non-camp residents, Alternative C would have less effect, and the other alternatives are not expected to have a long-term effect. Of course, the subsistence hunters who have previously used this area will have the opportunity to take advantage of the new access the same as new hunters, and will have the added advantages of knowing the area and of living relatively near the Project Area, since most are Sitka residents. When this factor is considered along with those discussed above under access, the logical conclusion is that the effect on overall subsistence use will be small.

The most likely effect of the combination of new access and competition by both previous and new hunters, if there are no changes in regulations governing deer harvest, is that the deer harvest will increase for the first one to three years. The increased harvest will lower the deer population, because more than 10 percent of the population is likely to be harvested. As the population declines, the harvest will also decline, because fewer deer will be available. As the hunter success ratio declines, fewer hunters will hunt in the Project Area. This effect would tend to discourage hunters from more distant communities more than those close by. If the harvest is sufficiently above the level of population sustainability or if a severe winterkill occurs, the population may decline substantially (i.e., to the level predicted by the habitat capability model, as discussed below). Without some change in harvest regulations, the population may take a number of years to recover to the level it apparently has been for the last few years, and then only if another series of mild winters occurs.

Reduction of Competition. Some hunters who have formerly used the Project Area may choose not to hunt there after harvest activities begin, either to avoid the activities themselves or because they dislike the results of the harvest activities. Others may choose to hunt elsewhere because they perceive that hunter competition will be too high to suit them. The number of such people may be small, but whatever the number is will be a reduction in the potential hunters. Based on the discussion above, the number of hunters in this category would be expected to increase each year during the timber harvest.

Overall Effect of Competition. Changes in competition resulting from implementation of any of the action alternatives would not be expected to change the percentage of deer harvested by subsistence communities. In general, all action alternatives will tend to favor ATV access to inland locations. This will be a shift from the customary method and means of skiffs or beach hunting. Hunters who have ATVs or can afford them would be favored.

Table 4-51

Habitat Capability for Sitka Black-tailed Deer in Wildlife Analysis Area 3311 and the Ushk Bay Project Area

Model Projection	**1992**	*A*	*B*	**Alternative** *C*	*D*	*E*	*F*
WAA 3311	1,443	1,443	1,339	1,236	1,347	1,253	1,325
Project Area	1,385	1,385	1,281	1,205	1,289	1,195	1,267
Percent Reduction	0	0	8	13	7	14	9

Source: Frostholm and Janis 1993

Abundance and Distribution

Harvesting of timber removes many of the habitat features that are necessary to sustain wildlife populations on the affected ground. This may effect the capability of that parcel of land to support wildlife. A GIS-based wildlife model was utilized to analyze habitat capability changes for the Sitka black-tailed deer. The model estimates the capability of habitats to support populations and does not reflect actual population levels. Table 4-51 displays the current habitat capability of the Wildlife Analysis Area 3311 and the Project Area, and the projected habitat capability at the end of timber harvest activities under each of the action alternatives.

Past activities have reduced deer habitat capability in WAA 3311 by less than 3 percent. The habitat capability model predicts a 7 to 14 percent reduction in deer numbers from the proposed timber harvest alternatives. This potential reduction represents between 101 and 202 animals in a potential population of 1,443. The cumulative reductions in habitat capability from past and currently proposed actions range from 10 to 17 percent.

The effect of the reduction of habitat capability as modeled is assumed to be a commensurate reduction in the deer population over a period of years including those with a severe winter. Based on the harvest records for Wildlife Analysis Area (WAA) 3311 and the adopted sustainable harvest level of 10 percent of a population, it is reasonable to assume that WAA 3311 has had a deer population of substantially more than 1,443 during the years of 1988-1991. This population sustained an average harvest of 262 deer per year for those four years. The 1988-1990 harvests were 306 to 354 deer. If 10 to 15 percent of the population was harvested in those years, the population would have ranged from 2,040 to 3,540 deer. This period culminated a period of relatively mild winters during which deer winter survival was high. The winter of 1989/1990 was apparently a moderately severe winter with a larger winterkill than the previous few winters, so the population apparently declined in 1990. The 1991 harvest was dramatically lower (about one-sixth the previous three-year average). This was apparently related to the winter of 1990/1991 being a mild winter and the deer staying away from the beach and being inaccessible to hunters.

The effect of the action alternatives on the carrying capacity of the Project Area for seasons other than winter is smaller than the effect on winter carrying capacity for several reasons. First, the summer range is usually not limiting to the population. Second, all of the timber harvest units are in the winter range habitats. This same area would serve as summer range habitat for an estimated 25 percent of the deer that are resident and do not migrate altitudinally (Schoen and Kirchhoff, 1985). No timber harvest and only a small amount of road building would occur under any of the action alternatives in the highest-value summer habitats, including meadows, muskegs, scrub-shrub riparian, and non-commercial forest. The percentage of these habitats affected would range from less than half of one percent for Alternatives B, D, and F to about one percent for Alternatives C and E.

Therefore, the effect of this habitat capability reduction on subsistence hunting may primarily be felt following a severe winter, and in the proportion that the habitat capability has been reduced.

Demand versus Supply

The *Wildlife* section of this chapter estimates, based on ADF&G data, that deer in WAA 3311 are currently being harvested at levels greater than the population can sustain. Figure 4-9 displays estimated deer available for harvest and estimated harvest demand for WAA 3311. These figures compare current demand for deer, based on ADF&G surveys, with the estimated number of deer that would have been available for harvest based on modeled habitat capability in 1954, before any timber harvesting. The average deer harvest levels in WAA 3311 are greater than the estimated population could have sustained prior to any timber harvest. Determining what harvest levels are sustainable assumes that habitat capability projections from the deer harvest model reflect an approximation of the deer population. Furthermore, it is based on the determination by ADF&G that the sustainable harvest level is 10 percent of the deer population (Flynn and Suring 1989).

As shown in Figure 4-9, the estimated deer habitat capability, even in 1954, was insufficient to meet subsistence demand in 1992. The projected deer habitat capability will continue to be insufficient to meet subsistence demand in WAA 3311 in the year 2000. None of the proposed alternatives would significantly change this situation, although all the action alternatives would make the deficit slightly greater. The estimated cumulative effect of implementing Alternative P of the Proposed Revised TLMP (USDA Forest Service 1991d) would be a marginal widening of the existing gap between deer supply and demand.

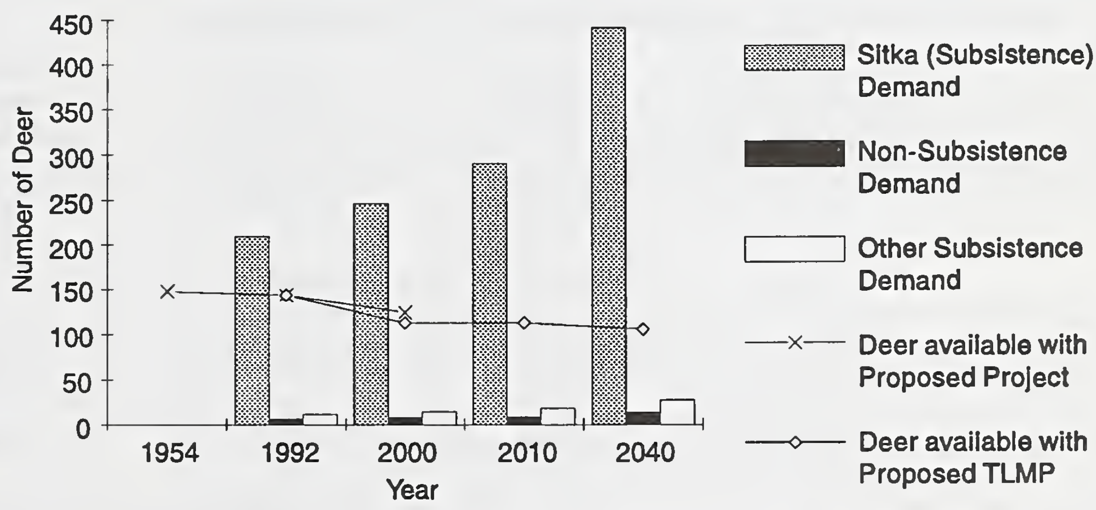
Summary of Direct and Indirect Effects on Subsistence Deer Harvest

Two types of comparisons are summarized in this section. The first is the level of change by alternative in the major factors that may affect subsistence deer harvest. This will give decision makers a more detailed basis while considering the effects of each alternative than the second set of comparisons. The second type of comparison summarized below is the level of potential effect on subsistence harvest expected from these changes.

Subsistence deer harvest may be affected by changes in access, competition, and the abundance and distribution of deer. Table 4-52 displays a summary comparison of the net changes under each alternative of each of the three main factors that may affect subsistence harvest of deer in the Project Area. In this table, short-term changes are considered to be those that occur during the period of timber harvest activities (three to five years), while long-term changes will extend beyond the period of harvest activities. For comparison purposes, the relative changes in each factor are given a subjective index value (low = 1, moderate = 2, and high = 3). These index values are then added to show the combined changes in the three factors for short-term, long-term, and combined changes. This makes it easy to see how the action alternatives rank, with the least changed one having the lowest combined index number.

From the above summary, it is clear that Alternatives B and F would have the smallest changes, short-term, long-term, or total. Alternatives D and E are similar and have a slightly

Figure 4-9
Estimated Deer Available for Harvest and Harvest Demand for WAA 3311



Note: Bars represent estimated and projected deer harvest demands based on 1988-1992 harvest data (ADF&G 1993). Projected demand assumes harvest patterns remain constant and demand increases with projected populationgrowth at 18 percent per decade through 2010 and 15 percent per decade through 2040. "Project" line shows 10 percent of the estimated habitat capability for deer in 1954 before timber harvest, in 1992, and in 2000 for the "worst-case" alternative. "TLMP" line displays 10 percent of the habitat capability for proposed Alternative P.

higher index value (change). Alternative C has the highest index value and level of change.

The effects on subsistence use that would result from the changes summarized above are generally small. The effects from changes in access are expected to result in very little change in the percentage of deer harvested by subsistence hunters. The effects of changes in competition on subsistence use are also likely to be small in the long-term. In the short-term, traditional harvesters will likely be displaced into other areas. The major effect is likely to be a redistribution of deer among subsistence hunters rather than a replacement of subsistence hunters with non-subsistence hunters. The effect on subsistence use from the expected reduction in habitat capability for production of deer will also be small. The habitat capability of the Project Area for deer would be reduced by 7 to 14 percent (depending on which action alternative is selected). This reduction would apply to the percentage of the annual deer harvest that comes from the Project Area for each subsistence community that uses the area. The community of Sitka has accounted for more than 90 percent of the deer harvested from the Project Area in each of the years of harvest records. The maximum effect on the Sitka harvest would be a reduction of 10 to 20 deer. The total Sitka deer harvest has averaged over 3,500 deer per year from 1988 to 1991. A reduction of 10 deer would be about 0.3 percent of their harvest, and 20 deer would be 0.6 percent. Even if the total harvest was half, these reductions would represent one percent or less. The effects on communities that harvest one percent or less of their deer from the Project Area would be proportionally smaller.

Communities Affected

ADF&G Technical Papers indicate that residents of Sitka and Wrangell have used the Project Area for subsistence fishing (Gmelch and Gmelch 1985; Cohen 1989). Sitkans have used the area to fish for salmon and halibut, while Wrangell residents have used the area to fish for salmon and other finfish. In addition, Sitka residents have used the Project Area to harvest crabs (Gmelch and Gmelch 1985). Due to the distance from the Ushk Bay Project Area, it is assumed that relatively few Wrangell residents other than tug operators in the area moving log rafts or others with similar reasons to be there would use the area on a regular basis for subsistence fishing. Based on scoping and public comments, the Project Area is especially important to Sitka residents for king crabs.

Table 4-52
Summary Comparison of Changes in Access, Competition and Productivity

Alternative	Abundance (% reduction in habitat capability)	Access Changes (short/long-term)	Competition Changes (short/long-term)	Combined Changes (short/long/total)
B	8 (1)	small/small (1/1)	M/L (2/1)	4/3/6
C	13 (2)	moderate/moderate (2/2)	H/M (3/2)	7/6/11
D	7 (1)	moderate/moderate (2/2)	H/M (3/2)	6/5/10
E	14 (2)	moderate/small (2/1)	M/L (2/1)	6/4/8
F	9 (1)	moderate/small (2/1)	L/L (1/1)	4/3/6

Source: Frostholm and Janis, 1993

Subsistence Use of Fish and Shellfish

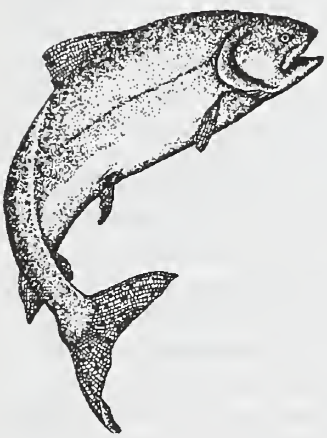
Direct and Indirect Effects

The activities associated with the timber harvest may result in impacts on subsistence resource harvesting of fish and shellfish. These activities include construction and use of LTFs and maintaining a logging camp, and possibly the roads and harvest units themselves. The types of impacts that could result include restrictions of access, effects of competition, and reduction of productivity of fish or shellfish habitat. Each type of impact is discussed below.

Access

Access to subsistence fish and shellfish areas will not be physically changed by any of the action alternatives. Access will continue to be by boat or floatplane. However, during the period of timber harvest activities, the presence of a logging camp and the log handling activities at the LTFs will undoubtedly discourage subsistence users other than camp residents seeking fish and shellfish from using the anchorage in Ushk Bay. This is especially true for Alternatives B, C, and D, which have the camps at Ushk Bay. Alternative F would not have a camp or LTF at Ushk Bay, and therefore not cause the access restriction. Alternative E would have the LTF and not the camp at Ushk, but would still have an effect on access for users other than logging camp residents.

Competition



Competition for fish and shellfish is likely to be increased by residents of the logging camps during timber harvest activities. It is expected that some of the logging camp residents will harvest these resources from the Project Area. Due to the proximity of the logging camps to the water and the availability of boats to camp residents, competition with other users would occur during the 3 to 5 year period in which timber is actively harvested.

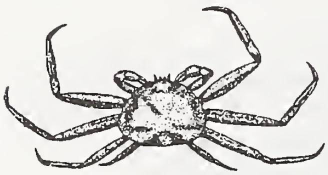
The location of the logging camp is not expected to have any measurable effect on competition for fish and shellfish. This is primarily due to the availability of boats. The camp residents at any one of the camp locations would be close enough to the entire Project Area to easily reach their preferred fishing areas by boat. The type of logging camp (land-based or floating) is also not expected to have a significant effect because no factors affecting the harvest of fish or shellfish would differ between the two.

Competition would be most noticeable for limited resources like king and Dungeness crabs and least noticeable for more abundant resources like pink salmon. A commercial fishing operation regularly fishes for Dungeness crabs in the Project Area, reducing the available numbers substantially during every harvest season. In addition, Ushk Bay is the most popular anchorage in the area and it is typical for transient boats to set out crab pots overnight.

Long-term competition, that extending beyond the timber harvest period, would probably not be affected by the project activities. There could be a slight increase because some of the camp residents who were not previously acquainted with the area may return from the communities to which they move after the logging camp closes because they have come to know and like the Project Area.

Fish and Shellfish Production Capability

Limited information is available on the distribution and abundance of fish and shellfish. Average peak escapement counts were used to determine the availability of salmon in the Project Area. Although the years of record for salmon escapement counts vary, and stream data does not exist for all streams in the Project Area, escapement is the best estimate of the availability of this resource. Escapement counts for streams tributary to Ushk Bay are 24,300 salmon; streams tributary to Poison Cove range from 11,650 to 16,650 salmon; and for streams tributary to Deep Bay the escapement counts are 41,683. Sitka residents, the closest community to the Project Area, harvest salmon and trout using nets and rods and reels (Schroeder 1989). One family has reported using Deep Bay Creek for subsistence fishing for six generations. Sitka residents have obtained subsistence permits for Deep Bay, Ushk Bay, and 28 locations outside



the Project Area. Per capita harvest of salmon and trout are 25 pounds and 16 pounds, respectively. Given the number of locations Sitka residents use to harvest these resources for the per capita harvest, it appears that the availability of resources in the Project Area is sufficient to support subsistence harvesting.

Stream productivity would be reduced only very slightly if at all by any of the action alternatives. The relative impacts to the fisheries for each alternative have been determined (see the *Fish and Watershed* section of this chapter). Alternative C would have the greatest relative impact on fisheries, while Alternative D would have the least, and the other alternatives would be intermediate. Log storage associated with the LTFs and the temporary storage of rafts preparing to go through Sergius Narrows would also probably have a slight effect on salmon rearing. Juvenile pink salmon spend much time near the shore. They reportedly are more vulnerable to predators that can hide at log rafts. Much of this effect would occur even with the No-Action Alternative. The overall reduction of fish habitat productivity would be very small during the timber harvest activities and even smaller afterwards because the Forest Service standards and guidelines described in the Aquatic Habitat Management Handbook would reduce the potential impacts substantially.

The effects of timber harvest and road construction on shellfish populations would be minimal for all the alternatives. Log transfer facilities present the greatest potential for adverse effects on shellfish, as LTF construction will temporarily impact a small amount of marine habitat and the resident marine organisms, and in some situations bark accumulation has been a recognized problem (see the *Marine* section of this chapter). Marine organisms will recolonize the LTF ramps within one season once activity at the LTF is discontinued. Application of the siting guidelines developed by the Alaska Timber Task Force will minimize the effects of construction and operation of the LTFs. The short period of use and relatively small amount of logs that will go through the LTFs will also minimize bark accumulation. Poison Cove has been used for some time as a temporary storage and staging area for log rafts going through Sergius Narrows. Thus, it has been affected by bark debris and other factors attendant to the log rafts. Additionally, construction of from one to four LTFs will affect so little of the available marine habitat that short-term and long-term effects on the marine ecosystem will be minimal as a result of LTF use. While effects are expected to be minimal, some areas are known to produce more shellfish than others and are therefore perceived to be more important to subsistence users. Alternative F, with only one LTF at an existing log storage site, would have the least impact on shellfish. Alternative E, with its location on the north side of Ushk Bay is near an area that may be especially important as a marine invertebrate "nursery area" and may be prone to accumulation of bark debris.

Summary of Direct and Indirect Effects on Subsistence Harvesting of Fish and Shellfish

The potential effects on access, for users other than logging camp residents, from timber harvest activities under Alternatives B, C, D, and E, may be notable, primarily because of LTFs and the logging camp. Competition for fish and shellfish harvested by subsistence users would increase during the time when the logging camp is occupied, but following the end of the timber harvest activities, the level of competition would be expected to return to pre-harvest levels. The productivity of fish habitat would be reduced only slightly if at all since the Forest Service standards, guidelines and prescriptions described in the Aquatic Habitat Management Handbook will be applied. However, Alternative E may affect a marine invertebrate nursery area of particular importance to the sea cucumber.

Communities Affected

ADF&G Technical Papers indicate that Sitka residents have used the Project Area for trapping of furbearers and that Angoon residents have used the Project Area for seal hunting (Gmelch and Gmelch 1985; George and Bosworth 1988).

Direct and Indirect Effects

The activities associated with the timber harvest may result in impacts on the harvesting of other resources for subsistence purposes. Logging activities will affect access of trappers to furbearers and are likely to increase competition for them.

Under Federal law, only Alaska Natives may harvest marine mammals. Maps derived from TRUCS data indicate that the Project Area has not been used to harvest marine mammals, so no effects on the subsistence harvest of marine mammals are expected.

Access

Access to the Project Area has been by boat, and no change from that is expected as a result of timber harvest. However, logging roads would increase access to stream valleys toward the interior of the Project Area where furbearers may be trapped. Most river otters and martens are taken near the beach and along creeks. New LTFs and roads paralleling the beach may make access easier for trappers. The alternatives that give access to the high elevation interior areas may increase access for bear hunters during the early summer when brown bears may be more likely to be found at higher elevations. All the action alternatives would open access to some of the stream valleys where the bears may gather during the salmon runs. As stated before, some Sitka residents use ATVs while subsistence harvesting, and it is likely that Sitka residents would use more of the Project Area if it were accessible. The effects of changes in access would be similar to those described for deer. Based on past experience on Northeast Chichagof Island near Hoonah, it may be necessary to restrict motorized vehicle access by trappers and bear hunters to maintain healthy populations.

Subsistence Use of Other Wildlife

Competition

There would be no change in subsistence use of marine mammals as a result of competition. Competition for other wildlife harvested for subsistence purposes would be affected similarly to that described for deer. That is, competition could be affected by: (1) residents from logging camps harvesting wildlife during the years of timber harvest activities, (2) new hunters who have not previously used the Project Area using it because of the road access, and (3) changes from logging activities causing some people who have used the Project Area on a regular basis to no longer use it. These changes may include the presence of logging camp residents, the logging activities, road access, and the perceived reduction in availability of wildlife.

It is likely that camp residents would replace the traditional trappers in the Project Area during the 3 to 5 year harvest period, based on experiences near Hoonah. The number of current users who would be affected is undoubtedly very small. The populations of otters and martens are small enough that one or two trappers could take all the harvestable animals from the population in a winter. During this time, previous trappers would probably be displaced. If there are no winter residents at camp who are trappers, there would be no effect. After the timber harvest is over, the alternatives with roads closed would have little if any continuing effect from competition. In the alternatives with roads left open (Alternatives C and D), trappers would have easier access to trapping areas, which might attract greater trapper competition or cause trappers with ATVs to displace some traditional trappers.

Similarly, the presence of camp residents and timber workers will make it likely that the harvesters of brown bears will change. More bear-human encounters will occur because of the increased human activity throughout the Project Area, especially the lower reaches of streams where the bears take salmon. Additional encounters will probably result in some bears being killed in defense of life and property. The alternatives with more valley mouths being roaded (Alternatives C, D, and E, especially) will have the greatest changes. During the presence of road-building and timber-harvest crews and camp residents, it is likely that a substantial percentage of the bear harvest in the Project Area will be by these people. Since a low percentage of bears have been taken by subsistence community residents (2 of 16 bears in seven years), the

Table 4-53
Habitat Capability Changes for Other Wildlife Species Harvested from the Ushk Bay Project Area, by Alternative

		Alternative (Percent Reduction)					
Species	1992	A	B	C	D	E	F
Marten	63	63 (0)	58 (9)	55 (14)	59 (7)	55 (14)	58 (9)
River Otter	37	37 (0)	32 (15)	29 (21)	32 (15)	29 (21)	30 (18)
Brown Bear	58	58 (0)	55 (5)	53 (9)	55 (5)	53 (9)	54 (7)

Source: Frostholm and Janis, 1993

effect on subsistence harvesting will be very small. After the timber-harvest activities end, Alternatives C and D would have open roads. The open roads would continue to modify how bears might be hunted in the Project Area and how competition would affect the harvest. The other alternatives would revert back to pre-timber harvest patterns.

Abundance and Distribution

Harvesting of timber and associated activities (road construction, timber harvest) will reduce habitat components in the activity areas that are important in sustaining the wildlife populations. Wildlife models were used to analyze habitat capability changes for three species known to have been harvested from the Project Area by subsistence community residents. Table 4-53 shows the current habitat capability for these three animals (marten, otter, brown bear) and the projected changes for each alternative.

The habitat capability reductions for the marten (7 to 14 percent), river otter (15 to 21 percent), and brown bear (5 to 9 percent) are notable reductions, but these resources from the Project Area are used by subsistence communities in such small numbers that the overall effect will also be very small.

Subsistence Use of Other Resources

Summary of Direct and Indirect Effects on Harvesting Other Wildlife

None of the alternatives would have an effect on harvesting of marine mammals. The increased access will exacerbate the effect of competition for other wildlife, which will be substantial during the years when the timber harvest is occurring and much less in later years. Under Alternatives C and D, with open road systems, some of the effects of access and competition would continue into future years. The effects on subsistence users of reductions in habitat capability and of competition will be relatively small because of the low level of use.

Other resources used by subsistence harvesters include berries, roots, mushrooms, greens (i.e., goose tongue), seaweeds, and firewood. Sitka is the closest community to the Ushk Bay Project Area. However, Sitka residents harvest most plants close to home, seldom travelling more than a few miles (Gmelch and Gmelch 1985). Therefore, no effects on subsistence harvesting of berries, roots, mushrooms, and greens are anticipated.

The proposed timber harvest is not expected to affect the ability of the subsistence harvester to gather seaweeds. Since alterations to the marine ecosystem from the LTFs will be very small, there should be no effects on the ability of the subsistence harvester to gather seaweeds while fishing or collecting shellfish.

The Forest Service has a free use policy for firewood and timber. None of the proposed alternatives will have an adverse effect on the availability of firewood and timber for personal use. Sitka households have collected approximately 37 percent of their wood from National Forest land (Gmelch and Gmelch 1985). However, harvesting of wood for personal use is typically done close to home. Gathering drift logs from Sitka beaches and pulling logs from water are common (Gmelch and Gmelch 1985). Thus due to the distance from the communities which have used the Project Area, it is not anticipated that the timber harvest would affect subsistence harvesters' ability to gather wood.

Cumulative Effects

The Ushk Bay Draft EIS evaluates the cumulative effects of past, presently proposed, and reasonably foreseeable forest management activities in the Project Area and on other National Forest lands associated with the continued implementation of the Tongass Land Management Plan (TLMP). This allows an assessment of whether future activities may restrict subsistence uses of resources.

Past timber harvest in the Project Area has occurred on 321 acres (less than one percent of the Project Area or about two percent of the old-growth forest in the Project Area). Based on past and projected future timber harvest, between 1,430 and 3,139 acres of old-growth forest habitat will be harvested in the Project Area. The *Wildlife* section projects that this level of harvest would affect the habitat capability of several wildlife species. The changes in habitat capability could affect their abundance and distribution. Relative to habitat capability projected for 1954, by the end of this project, the potential deer habitat capability is projected to decrease cumulatively by 9 to 16 percent; the potential brown bear habitat capability is projected to decrease cumulatively by 7 to 10 percent; the potential marten habitat capability is projected to decrease cumulatively by 9 to 15 percent; and the potential river otter habitat capability is projected to decrease cumulatively by 18 to 26 percent (Table 4-33).

These potential decreases in abundance could increase competition for the species important for subsistence. The abundance of brown bear, marten, and river otter appear to be sufficient to meet subsistence needs in the Project Area. Fish, shellfish, and other food resources should likewise be available to meet subsistence needs. Current deer habitat capabilities in WAA 3311 are below levels considered necessary to sustain the current harvest level for both subsistence and nonsubsistence communities. None of the proposed action alternatives would significantly change this situation.

The areas on Chichagof Island immediately surrounding the Project Area are under land use designations that make them unavailable for timber harvest. There will therefore not be a pattern of continuing timber harvest in the immediate area. The nearest proposed timber harvest area is on the northwestern part of Baranof Island across Peril Strait. This proposed harvest along with actions on other lands near the Project Area could affect the abundance or distribution, access to, and competition for the subsistence resources harvested by rural communities using the Project Area. Table 4-54 displays the other timber sale projects in progress or being planned in the vicinity of the Ushk Bay Project.

Enough is known about foreseeable activities on other lands surrounding the Project Area to project that subsistence use of deer may be significantly restricted in the future. Figures E-46 and E-47 in Appendix N provide a regional perspective of the deer supply and demand in Southeast Alaska. Demand refers to deer harvest estimates while supply refers to the number of deer available for harvest according to habitat capability models. Figure E-46 portrays demand (1987-90 average harvest) as a percentage of the 1990 deer supply (10 percent of the habitat capability) for each Wildlife Analysis Area (WAA). Where demand for deer exceeds 120 percent of the WAA supply, it is an indication that existing deer habitat is not sufficient to sustain present harvest levels. Chichagof and Baranof Islands pose special management concerns. Figure E-46 shows that in many WAAs on Baranof and Chichagof Islands the present supply of deer is not sufficient to sustain present demand. Within the Project Area, the supply of deer is currently not sufficient to sustain present demand in WAA 3311.

Figure E-47 projects deer demand versus supply 50 years from now. The model assumes that demand will increase in accordance with population projections and the habitat capability will be reduced as projected by this and other timber harvests scheduled in the Revised TLMP's preferred alternative (Alternative P). In the year 2040, the map shows the future deer supply

Table 4-54
Proposed Timber Sale Projects in the Chatham Area

Project	Projected Volume (in MMBF)	Projected Date
Kelp Bay	117.0	1992
Southeast Chichagof #1	127.6	1993
Eight Fathom Bight (Chicken/Neka)	127.0	1995
Northwest Baranof (Fish/Katlian)	75.0	1996

Source: USDA Forest Service 1991c.

in WAA 3311 and in WAAs surrounding the Project Area will not be sufficient to sustain future projected demand. Cumulatively, under this scenario, by the year 2040, demand will exceed the supply of deer (i.e., be greater than 120 percent of the supply) in every WAA on Chichagof and Baranof Islands except WAAs 3418 and 3628. Subsistence demand for deer alone will exceed the supply of deer in every WAA on Chichagof and Baranof Islands except WAAs 3418, 3628, 3629, and 3732. Given the cumulative effects on surrounding WAAs, hunting pressure may become more concentrated in WAAs where the supply of deer remains adequate, thus leading to greater increases in demand in these WAAs than projected on Figure E-47.

ANILCA Section 810 Subsistence Evaluation

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. Section 810 of ANILCA states:

- In determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands under any provision of law authorizing such actions, the head of the agency having primary disposition over such lands or his designee shall evaluate the effects of such use, occupancy, or disposition on subsistence uses and needs, the availability of other lands for purposes sought to be achieved and other alternatives which would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes. No such withdrawal, reservation, lease, permit, or other use, occupancy, or disposition of such lands which would significantly restrict subsistence uses shall be effected until the head of such Federal agency:

    1. gives notice to the appropriate State agency and appropriate local committees and regional councils established pursuant to section 805.
    2. gives notice of, and holds, a hearing in the vicinity of the area involved; and
    3. determines that (A) such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of the public lands; (B) the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition; and (C) reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions.

This subsistence evaluation considers whether there is a significant possibility of a significant restriction of subsistence use based on findings for each alternative and resource. The Alaska Land Use Council's definition of "significantly restrict subsistence use" is one guideline used in the findings. By this definition:

- 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 natural resources. Reductions in the opportunity to continue subsistence uses generally are caused by: reductions in abundance of, or major redistribution of resources; substantial interference with access; or major increases in the use of those resources by non-rural residents. The responsible line officer must be sensitive to localized, individual restrictions created by any action and make his/her decision after a reasonable analysis of the information available.

The U.S. District Court Decision of Record in *Kunaknana v. Watt* provided additional guidance defining restriction of subsistence uses. The definitions from *Kunaknana v. Watt* include:

- Significant restrictions are differentiated from insignificant restrictions by a process assessing whether the action undertaken shall have no or slight effect as opposed to large or substantial effects. In further explanation the Director (BLM) states that no significant restriction results when there would be "no or a slight" reduction in the abundance of harvestable resources and no occasional redistribution of these resources.

  There would be no effect or slight inconvenience on the ability of harvesters to reach and use active subsistence harvesting sites; and there would be no substantial increase in competition for harvestable resources (that is, no substantial increase in hunting by [non-rural residents]).

  Conversely, restrictions for subsistence uses would be significant if there were large reductions in the abundance or the major distribution of these resources, substantial interference with harvestable access to active subsistence sites or major increases in...[non-rural resident] hunting. In light of this definition, the determination of significant restriction must be made on a reasonable basis, since it must be decided in light of the total subsistence lands and resources that are available to individuals in surrounding areas living a subsistence lifestyle.

Resource Findings

Direct and Indirect Effects

The above analysis leads to the conclusion that the actions proposed in Alternatives B through F may not significantly restrict subsistence use of deer. The effects from changes in access are expected to result in little or no change in the percentage of deer harvested by subsistence hunters. The major effect of competition is likely to be a redistribution of deer among subsistence hunters rather than a replacement of subsistence hunters with non-subsistence hunters. Logging camp residents, although subsistence users, will likely displace traditional users during the 3 to 5 years of timber harvest. Additionally, hunters with ATVs may displace some traditional hunters that rely on skiffs and foot travel. The effect on subsistence use from the expected reduction in habitat capability for production of deer will also be small. The habitat capability of the Project Area would be reduced by 7 to 14 percent (depending on which action alternative is selected). This reduction would apply to the percentage of the annual deer harvest that comes from the Project Area for each subsistence community. The community of Sitka has harvested more than 90 percent of the deer from the Project Area in each of the years of harvest records. The maximum effect on the Sitka harvest would be a reduction of 9 to 18 deer. The total Sitka deer harvest has averaged over 3,500 deer per year from 1988 to 1991. A reduction of 10 deer would be about 0.25 percent of their harvest, and 18 deer would be 0.5 percent. Even if the total harvest in the Project Area was half, these reductions would represent one percent or less. The effects on communities that harvest two percent or less of their deer from the Project Area would be proportionally smaller. None of these effects represent a "substantial reduction in the opportunity to continue subsistence uses." Neither do they represent "large reductions in abundance or major redistribution of the resources, substantial interference with harvestable access to active subsistence-use sites or major increases in non-rural resident hunting."

Table 4-55
Significant Possibility of a Significant Restriction of Subsistence Use of Fish and Shellfish Resources

	Alternative					
	A	*B*	*C*	*D*	*E*	*F*
Abundance or Distribution	No	No	No	No	No	No
Access	No	Yes	Yes	Yes	Yes	No
Competition	No	No	No	No	No	No

Source: Frostholm and Janis, 1993

Note: "No" indicates no significant possibility of a significant restriction. "Yes" indicates a significant possibility of a significant restriction.

Based on effective changes in access during the period of active timber harvest, there may be a significant possibility of a significant restriction of subsistence use of fish and shellfish in Ushk Bay by Alternatives B, C, D, and E (Table 4-55). Alternative F does not present a significant possibility of a significant restriction because no LTF or logging camp is proposed in Ushk Bay.

There would not be a significant possibility of a significant restriction on subsistence use of brown bear, furbearers, marine mammals, or other subsistence resources. This is based on the potential resource effects on abundance and distribution of resources, access, and competition (Table 4-56).

Cumulative Effects

Two other recent timber harvest EISs in the general vicinity of Ushk Bay (Kelp Bay and Southeast Chichagof) have concluded that they would have a significant possibility of a significant restriction of subsistence use of resources (deer). In addition, two other timber harvest projects are scheduled in the general area (Northwest Baranof and Eight Fathom). It is therefore a reasonable finding that the cumulative effects of the Ushk Bay Project, along with these other projects, will have a significant possibility of a significant restriction of subsistence use of deer. This finding is summarized in Table 4-57 and applies to all alternatives for the Ushk Bay Project.

Determinations

Section 810(a)(3) of ANILCA requires that when a significant restriction may occur, determinations must be made in regard to whether:

- Such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of public lands;
- The proposed activity will involve the minimum amount of public lands necessary to accomplish the purposes of such use and occupancy, or other disposition;
- Reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions.

Necessary, Consistent with Sound Management of Public Lands

The alternatives proposed in the Ushk Bay Draft EIS 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, ANILCA, Alaska Regional Guide, TLMP, TLMP 1985-86, Alaska State Forest Practices Act, and the Alaska Coastal Zone Management Program have been considered.

Table 4-56

Significant Possibility of a Significant Restriction of Subsistence Use of Other Resources

	Alternative					
	A	*B*	*C*	*D*	*E*	*F*
Abundance or Distribution	No	No	No	No	No	No
Access	No	No	No	No	No	No
Competition	No	No	No	No	No	No

Source: Frostholm and Janis, 1993

Note: "No" indicates no significant possibility of a significant restriction. "Yes" indicates a significant possibility of a significant restriction.

Table 4-57

Significant Possibility of a Significant Restriction of Subsistence Use of Sitka Black-tailed Deer

	Alternative					
	A	*B*	*C*	*D*	*E*	*F*
Direct and Indirect Effects from Proposed Actions						
Abundance and Distribution						
Sitka	No	No	No	No	No	No
Other Rural Communities	No	No	No	No	No	No
Access	No	No	No	No	No	No
Competition	No	No	No	No	No	No
Cumulative Effects from Past, Present, and Reasonably Foreseeable Forest Management Activities						
Abundance and Distribution						
Sitka	Yes	Yes	Yes	Yes	Yes	Yes
Other Rural Communities	No	No	No	No	No	No
Access	No	No	No	No	No	No
Competition	No	No	No	No	No	No

Source: Frostholm and Janis, 1993

Note: "No" indicates no significant possibility of a significant restriction. "Yes" indicates a significant possibility of a significant restriction.

ANILCA placed an emphasis on the maintenance of subsistence resources and lifestyles. However, the Act also required the Forest Service to make available for harvest 4.5 billion board feet of timber per decade from the Tongass National Forest. The Tongass Timber Reform Act (TTRA) removed the 4.5 MMBF requirement from ANILCA but directed the Forest Service to seek to meet market demand for the planning cycle. Demand for timber from the Tongass National Forest is expected to remain near 400 MMBF per year from 1990 to 2010.

The action alternatives presented here encompass five different approaches that would produce the resources that would best meet the needs of the American people, and to help achieve multiple use management objectives in the TLMP. All of the action alternatives involve some potential impact on subsistence uses. There is no alternative that will meet TLMP objectives and yet avoid all impacts. Therefore, based on the analysis of the information presented in this document on the proposed alternatives, these actions are necessary, consistent with the sound management of public lands.

Amount of Public Land Necessary to Accomplish the Purpose of the Proposed Action

Much of the Tongass National Forest is used by one or more rural communities for subsistence purposes. The areas of most subsistence use are the areas adjacent to existing road systems, the beach and estuary fringes, and areas in close proximity to communities. Within the Project Area, the extent and location of subsistence use areas preclude complete avoidance. Areas other than subsistence use areas that could be harvested may be limited by other resource concerns such as soil and water protection, high value wildlife habitat, economics, visual quality, or unit and road design. Effort was taken to protect the highest value subsistence areas. For example, beach and estuary fringe is one of the highest use subsistence areas and four percent or less of the beach fringe and eight percent or less of the estuary fringe will be directly affected by roads or harvest units under any of the proposed alternatives.

The impact of viable timber harvest projects always includes alteration of old-growth habitat, which in turn always reduces projected habitat capability for old-growth dependent subsistence species. It is not possible to lessen harvest in one area and concentrate it in another without impacting one or more rural communities' important subsistence use areas. In addition, harvestable populations of game species could not be maintained in a natural distribution across the Tongass National Forest if harvest were concentrated in specific areas. A well distributed population of species is also required by the Forest Service regulations implementing the National Forest Management Act.

Reasonable Steps to Minimize Adverse Impact Upon Subsistence Uses and Resources

Reasonable steps to minimize impacts on subsistence have been incorporated in development of the alternatives and project design criteria. Some alternatives were designed to address specific areas of concern expressed during scoping. During development of alternatives, an effort was made to minimize activities that could adversely impact important subsistence use areas. Project design criteria called for locating roads and units outside of important subsistence use areas such as the beach fringe, estuary fringe, and riparian areas adjacent to salmon streams.

Other reasonable steps being considered include:

- Closing roads to hunting with a motorized vehicle during timber harvest.
- Placing multiple-boat mooring docks in Ushk Bay and near Vixen Island for alternate mooring space during the 3 to 5 years of timber harvest.
- Restricting log rafting in Ushk or Deep Bay during April, May, or June when king crab are in shallow water.

The Federal Subsistence Board may use its authority to prioritize the harvest of resources among rural residents when necessary to protect the resource. This type of action, as prescribed by ANILCA, Section 804, may be necessary to ensure the availability and adequate abundance of deer and crab needed by the rural communities using the Project Area. The current deer and crab population levels do not necessarily require restriction or prioritization of rural residents.

EIS Conclusions

The Record of Decision for the Final EIS for the Ushk Bay Project will include a final finding relative to ANILCA Section 810. If the finding changes, a final determination about the significant restriction on subsistence uses that may result from implementation of the selected alternative will also be included. Below is a summary of the EIS evaluation and findings.

- The potential foreseeable direct and indirect effects from the action alternatives in the Ushk Bay Project Area do not present a significant possibility of a significant restriction of subsistence uses of deer, brown bear, furbearers, marine mammals, and other foods under any of the action alternatives.
- Based on changes in access during the period of active timber harvest, there is a significant possibility of a significant restriction of subsistence use of fish and shellfish.
- On the basis of cumulative effects, there is a significant possibility of a significant restriction of subsistence use of deer in the Ushk Bay Project Area for Haines, Petersburg, Sitka and Wrangell residents regardless of which alternative is implemented.
- Among the communities using the Project Area, there is sufficient habitat capability in WAAs hunted by community residents to meet subsistence needs of all communities in the foreseeable future except for Sitka.

Hearings

On the basis of findings of this analysis and under the provisions of ANILCA, subsistence hearings were held on dates, times, and at the places announced in a letter accompanying the Draft EIS. Letters were sent to the Federal Subsistence Board, Alaska Department of Fish and Game, the Southeast Regional Fish and Game Advisory Council, Local Fish and Game Advisory Committees, and to the Post Offices in Angoon, Haines, Kake, Pelican, Petersburg, Rowan Bay, Sitka, and Wrangell. Announcements were also made in newspapers and on the radio. Testimony at the hearings, either verbal or written, was taken. People unable to attend were encouraged to have another person submit their written testimony at the hearing. People were encouraged to send written testimony to the Ushk Bay Planning Team, postmarked on or before the date of the hearing in the community for which the testimony was intended. Testimony received, both verbal and written, was incorporated into the Final EIS.

Heritage Resources

Cultural Overview

Archaeological sites contain the potential to provide information on past lifeways, environmental changes over time, and the relationship between human beings and the environment. With its many diverse environments, Southeast Alaska is well-suited to address such issues and further our understanding of the past (Autrey 1992). Because such resources are nonrenewable, it is important to study them before they are changed by natural or human causes.

The Forest Service has developed a research design and predictive model (see Autrey 1992) designed to gain insight into the function and distribution of archaeological sites across the region. This provides a data base to predict locations considered sensitive for cultural materials and to evaluate their significance (Gilman and Iwamoto 1992). Methods used for conducting the cultural resources inventory of the Ushk Bay Project Area are based on strategies outlined in the research design/predictive model.

Drawing on previous inventories in the Chatham Area, locations containing high and low sensitivity zones were identified in the Project Area. Table 4-58 summarizes sensitivity zones as defined in the Ushk Bay Project Area Research Design (Gilman and Iwamoto 1992). To control the high cost of conducting field work in Southeast Alaska, while maximizing efforts to locate cultural resources, only project locations falling within the high sensitivity zone, plus an additional 15 percent high-probability land sample established by the Forest Service, were inventoried during current investigations (Gilman and Iwamoto 1992).

Table 4-59 presents, by VCU and project alternative, the number of harvest units, LTFs, and road miles that were examined during the current inventory. All of these items fall in the high sensitivity zone discussed above, and so were inspected for cultural resources.

Direct and Indirect Effects

None of the five action alternatives proposed for the Ushk Bay Project Area will have an effect on cultural resources identified within project boundaries.

Cumulative Effects

Cumulative effects on cultural resources can occur through natural erosion and weathering as well as from the continued modern development of lands containing archaeological sites. Continuous management of these resources through protective actions, such as those proposed in the Forest Service Research Design and various Federal regulations, can minimize the loss of information potentially contained in these resources.

Table 4-58
Cultural Sensitivity Zones

Sensitivity Zone	Forest Service Designation
High	All lands located between sea level and the 100-foot contour, or areas believed to contain a high potential for cultural resources based on previous investigations.
Low	All other elevations and lands not included in high sensitivity areas.

Source: Wesson et al. 1993

Other Environmental Considerations

Probable Adverse Environmental Effects that Cannot be Avoided

Implementation of any action alternative may result in some adverse environmental effects that cannot be effectively mitigated or avoided if the proposed action is to take place. The interdisciplinary procedure used to identify specific harvest units and roads was designed to eliminate or lessen the significant adverse consequences. In addition, the application of standards and guidelines, BMPs, mitigation measures, and a monitoring plan are intended to further limit the extent, severity, and duration of these effects. The specific environmental effects of the alternatives were discussed earlier in this chapter, and the proposed mitigation measures are discussed for each alternative in Chapter 2. Although the formulation of the alternatives included avoidance of potentially adverse environmental effects, some adverse impacts to the environment which cannot be completely mitigated may occur.

Although standards and guidelines, BMPs, and monitoring plans are designed to prevent significant adverse effects to soil and water, the potential for adverse impacts does exist. Sediment production would occur as long as roads are being built and timber is harvested. Sediment would be produced by surface erosion, channel erosion, and mass movement.

Disturbance, displacement, or loss of fish and wildlife may occur as a consequence of habitat loss and increased human activity in the Project Area. New road construction and the human activities associated with new access to areas previously unroaded will result in impacts to fish and wildlife. Improved access into areas that previously had limited roads would have similar effects. The proposed activities will likely increase competition for subsistence resources.

Ground-disturbing activities would temporarily increase sediment loads in some streams. This could displace fish, reduce anadromous and resident fish reproductive success, and alter aquatic invertebrate populations. In addition, a loss of fish habitat would occur at road crossings of streams. The portion of a stream bed occupied by a culvert or other structures would be lost as fish habitat.

Both the amount and distribution of mature and old-growth stands would be reduced through implementation of any action alternative. The rate and severity of adverse impacts varies by alternative. Because some wildlife species rely on habitat conditions provided by old-growth stands,

Table 4-59

Number of Units, LTFs and Road Miles Surveyed for Cultural Resources

VCU	Item	Alternative B	C	D	E	F
279	Harvest Units	4	9	4	10	7
	LTF's	1	2	1	2	1
	Miles of Road	2	6.9	5.1	6	2.6
280	Harvest Units	0	6	5	6	6
	LTF's	0	1	1	0	0
	Miles of Road	0	4.5	4.3	3.4	3.2
281	Harvest Units	16	19	11	18	15
	LTF's	1	1	1	1	0
	Miles of Road	10.8	13.1	11.8	13.2	12.4

Source: Wesson et al. 1993

the reduction in the populations of some wildlife species can be expected. As old-growth and mature timber stands are converted to young even-aged stands, the capability of the Project Area to provide optimal habitat for old-growth dependent species would be reduced.

Timber harvest and road construction in areas that are currently unroaded will alter natural characteristics of these areas. This will modify the recreational experiences that are offered by these areas. Both Primitive and Semiprimitive recreational opportunities will be lost by these actions. In addition, these development activities will result in a loss of opportunity to consider these areas in future revisions of the Forest Plan, for designation as wilderness, as research natural areas, or for other purposes requiring natural characteristics.

The natural landscape will appear visually altered by timber harvest, particularly where logging activity is highly visible from travel routes. These adverse effects will eventually be reduced by growth of vegetation. Other impacts on the natural appearance of the landscape include roads and structures which are highly visible despite efforts to blend them with land forms and mitigate the effect by landscaping.

The intensity and duration of these effects depends on the alternative and the mitigation measures applied to protect the resources. Most unavoidable effects are expected to be short term (usually less than two years). In all cases, the effects would be managed to comply with established legal limits, such as a maximum time for regeneration. To check and reduce these effects, monitoring procedures and mitigation measures have been planned for those areas which may be affected. Certain monitoring procedures and mitigation measures are required by existing standards or guidelines. Specific mitigation measures for each alternative are included in Chapter 2.

All alternatives would come under the mandate of the Multiple Use and Sustained Yield Act of 1960, which requires the Forest Service to manage National Forest lands for multiple uses (including timber, recreation, fish and wildlife, range, and watershed). All renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be re-established and grown again if the productivity of the land is not impaired.

Maintaining the productivity of the land is a complex, long-term objective. All alternatives protect the long-term productivity of the Project Area through the use of specific standards and guidelines, mitigative measures, and BMPs. Long-term productivity could change as a result of various management activities proposed in the alternatives. Timber management activities will have direct, indirect, and cumulative effects on the economic, social, and biological environment.

Soil and water are two key factors in ecosystem productivity, and these resources will be protected in all alternatives to avoid damage which could take many decades to rectify. Sustained yield of timber, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. Quality and quantity of water from the Project Area may fluctuate as a result of short-term uses, but no long-term effects to the water resource are expected to occur as a result of timber management activities.

Relationship Between Short-term Uses and Long-term Productivity

All alternatives would provide the fish and wildlife habitat necessary to maintain viable, well-distributed populations of existing native and desired non-native vertebrate species throughout the Project Area. The abundance and diversity of wildlife species depends on the quality, quantity, and distribution of habitat, whether used for breeding, feeding, or resting. Management Indicator Species are used to represent the habitat requirements of all fish and wildlife species found in the Project Area. By managing habitats and populations of indicator species, the other species associated with the same habitat would also benefit. The alternatives provide standards, guidelines, and mitigation measures for maintaining long-term habitat and species productivity. The alternatives vary in the risk presented to both wildlife habitat and habitat capability.

Timber rotations are approximately 100 years. To ensure adequate production of timber, harvest has been scheduled to allow the earliest cut stands to mature into merchantable timber before the planned harvest of original stands is complete. When the first rotation is complete, mature timber stands would be harvested again on a new rotation. Management of the timber resource on these rotations could affect long-term productivity, depending on the intensity of silvicultural practices. Projected timber rotation lengths are not anticipated to affect long-term productivity. Mitigation measures are planned under all the alternatives to ensure future availability of other renewable resources as well.

Opportunities for dispersed recreation use, including hiking, camping, fishing, hunting, and viewing the natural scenery, will be maintained and increased for future generations. The setting in which these activities occur varies by alternative, but the long-term potential for the Project Area to provide a spectrum of recreation opportunities would be maintained in all alternatives.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are decisions to use, modify, or otherwise affect nonrenewable resources such as cultural resources or minerals. It could also apply to resources renewable only over a long period of time such as soil productivity or old-growth forests. Such commitments of resources are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or the resource has been destroyed or removed. All alternatives result in some irreversible commitments, although the extent and potential for adverse effects increase in alternatives which emphasize resource extraction and utilization.

Irretrievable commitments represent opportunities foregone for the period of the proposed actions, during which other resource utilization cannot be realized. These decisions are reversible, but the utilization opportunities foregone are irretrievable. Under multiple-use management, some irretrievable commitments of resources are unavoidable due to the mutually exclusive relationship between some resources. An example of such a commitment is development of logging camps and LTFs that will be removed at the completion of logging activities. These developments occupy approximately 5 to 10 acres and include bunkhouses, mobile homes, fuel storage facilities, etc. For the 3 to 5 years that such developments exist, the opportunity to otherwise utilize these areas is foregone, and thus irretrievable.

The irreversible disturbance of some types of cultural resources may occur as a consequence of management activities. This would be especially true for subsurface resources that cannot be located through surface surveys. Even with mitigation, unanticipated or unavoidable disturbances can result in the loss of cultural values. Mitigation efforts such as data recovery involve the scientific and controlled destruction of a cultural resource site. Once undertaken, the effects are irreversible and the mitigation effort becomes an irretrievable commitment to the resource.

The use of energy resources and the removal of mineral resources are irreversible commitments of resources. The utilization of rock resources for road and facility construction is an example. The use of fossil fuels during project administration activities would be an irreversible resource commitment. Alternatives vary by the amount of energy and mineral resources used; the No-Action Alternative abstains from the use of these nonrenewable resources at this time.

In unroaded areas, development activities such as timber harvest and the road construction associated with harvest will irreversibly reduce the potential amount of area that could be designated as a part of the National Wilderness Preservation System, managed as a Research Natural Area, or managed for other purposes requiring natural characteristics.

An irreversible loss occurs when forests of old-growth trees are harvested, fragmented, or removed for the construction of roads or other purposes. Old-growth stands provide key wildlife habitat and are also valued for ecological and aesthetic reasons. Because old-growth stands take more than 150 years to develop, the commitment of this resource to certain uses is reversible over a long period of time.

Some long-term uses of the land cause an irreversible loss of soil productivity. Examples of these uses include the establishment of arterial and collector roads and log transfer facilities.

Possible Conflicts with Plans and Policies of Other Jurisdictions

The regulations for implementing NEPA require a determination of possible conflicts between the proposed action and the objectives of Federal, State, and local land use plans, policies, and controls for the area. The major land use regulations of concern are the CZMA, Section 810 of ANILCA, and the State of Alaska's Forest Practices Act. A discussion of each of these determinations is presented below.

Coastal Zone Management Act of 1976 (CZMA)

The CZMA was passed by Congress in 1976 and amended in 1990. This law, as amended, requires Federal agencies conducting activities or undertaking development which affect the coastal zone to ensure that the activities or developments are consistent with approved State coastal management programs to the maximum extent practicable. The State of Alaska passed the Alaska Coastal Management Act in 1977 to establish a program that meets the requirements of the CZMA. It contains the standards and criteria for a determination of consistence for activities within the coastal zone.

The Alaska Coastal Management Program (ACMP), in turn, encourages local coastal communities to develop local policies that guide the development of coastal resources. The City and Borough of Sitka participates in the program and has established the Sitka Coastal Management Citizens Committee, of which the Forest Service is a member. The City and Borough has also developed the Sitka District Coastal Management Program, which has as its goal "... to achieve wise use of the land and water resources of the coastal area and to balance economic growth with ecological and cultural values, so as to maintain and protect Sitka's coastal resources for the beneficial use and enjoyment for present and future generations." The Ushk Bay Project Area lies entirely within the boundary for the Sitka Coastal District.

Forest Service requirements for consistency are detailed in a Memorandum of Understanding (MOU) between the State of Alaska and the Regional Forester, dated October 8, 1981. Standards against which the consistency evaluation will take place are: Alaska Statute Title 46, Water, Air, Energy, and Environmental Conservation; Alaska Forest Practices Act of 1990; and the Sitka District Coastal Management Program.

The Forest Service has evaluated the alternatives to ensure that the activities and developments affecting the coastal zone are consistent with approved coastal management programs to the maximum extent practicable. The standards and guidelines for timber management activities in the Ushk Bay Project Area meet or exceed those indicated in the Alaska Forest Practices Act and the Alaska Coastal Management Program.

Evaluation of the proposed activities against standards and requirements for activities within the coastal zone results in a finding that these activities are consistent with the Alaska Coastal Management Program to the greatest extent practicable. In accordance with the Memorandum of Understanding and Alaska Statutes, the Office of Governmental Coordination will do a consistency review of the preferred alternative.

Alaska National Interest Lands Conservation Act of 1980 (ANILCA)
Under Section 810 of ANILCA, agencies are required to evaluate the effects of proposed actions on subsistence uses of Federal land and to determine if the proposed action may significantly restrict subsistence opportunities. Refer to the *Subsistence* section of this chapter for the evaluation of impacts to subsistence use as a result of the alternatives.

State of Alaska's Forest Practices Act of 1990
On May 11, 1990, Governor Cowper approved the legislature's major revision of the State's Forest Practices Act. The revised act significantly increases the State's role in providing protection and management for important forest resources on State and private lands. The revised Forest Practices Act will also affect National Forest management through its relationship to the ACMP and the Federal CZMA (see above discussion).

For National Forest timber operations such as proposed for the Ushk Bay Project, the effect of the revised Forest Practices Act is essentially two-fold. First, it clarifies that the revised Forest Practices Act is the standard which must be used for evaluating timber harvest activities on Federal lands for purposes of determining consistency, to the maximum extent practicable, with the Alaska Coastal Zone Management Program. Second, it calls for minimum 100-foot buffers on all Class I streams, and it recognizes that consistence to the maximum extent possible for purposes of the Alaska Coastal Management Program is attainable in Federal timber harvest activities, using specific methodologies which may differ from those required by the revised Forest Practices Act or its implementing regulations.

The TTRA prohibits commercial timber harvesting within buffer zones established on all Class I streams and those Class II streams which flow directly into Class I streams. Buffer zones have a minimum width of 100-feet horizontal distance from the edge of either side of the stream. In addition, the Forest Service is currently working with the Alaska State Division of Governmental Coordination on a revision of the MOU between the State and the Forest Service. This revised MOU will establish the policies and procedures for coordinating State review of Forest Service programs and activities, including those covered by the Forest Practices Act and the Alaska Coastal Management Program.

Energy Requirements and Conservation potential of Alternatives

The implementation of the proposed actions in the Ushk Bay Project Area will require the expenditure of energy (e.g., fuel consumption). The amount of energy used varies by alternative based on timber volume harvested and miles of road constructed. The direct effect of the alternatives on energy requirements would be attributed to timber harvest, road construction, and travel necessary to administer the timber sale. Indirect energy requirements include process-

Table 4-60
Estimated Fuel Consumption (Millions of Gallons), by Alternative

	Alternative					
	A	*B*	*C*	*D*	*E*	*F*
Preparation and Administration (1.56 gallons/MBF)	0	0.07	0.11	0.06	0.12	0.08
Logging and Transportation (14.8 gallons/MBF)	0	0.63	1.05	0.58	1.11	0.76
Road Construction and Maintenance (4,000 gallons/mile)	0	0.14	0.25	0.20	0.26	0.19
Total Consumption	0	0.84	1.41	0.84	1.49	1.03

Note: The estimated fuel consumption for timber harvest activities is based on consumption per MBF of sawlog volume. Sawlog volume is estimated to be 79 percent of the total volume.

ing wood products and the transport of the products to secondary processors and consumers. The estimated total fuel consumption required for each alternative is displayed in Table 4-60.

Natural or Depletable Resource Requirements and Conservation of Alternatives

All alternatives considered in detail are designed to conform to applicable laws and regulations pertaining to natural or depletable resources, including minerals and energy resources. Regulation of mineral and energy activities on the National Forest, under the U.S. Mining Laws Act of May 1872 and the Mineral Leasing Act of February 1920, is shared with the Bureau of Land Management (BLM). The demand for access to National Forest lands for the purpose of mineral and energy exploration and development is expected to increase over time.

The action alternatives propose road construction that will increase opportunities for access to the National Forest within the Ushk Bay Project Area. This increased access may result in increased activity with regard to potential mineral or energy resource occurrences.

Urban Quality, Historic and Cultural Resources, and the Design of the Built Environment

The Ushk Bay Project Area contains no urban areas or built-up areas of any kind. Therefore, the only applicable concern under this topic is with historic and cultural resources. The goal of the Forest Service's Cultural Resource Management Program is to preserve significant cultural resources in their field setting and ensure they remain available in the future for research, social/cultural purposes, recreation, and education. There are adequate standards, guidelines, and procedures to protect cultural resources and to meet the goals of the Cultural Resource Management Program. Cultural resources and the proposed project design are discussed in the *Cultural Resources* section of this chapter.

Effects of Alternatives on Consumers, Civil Rights, Minorities, and Women

All Forest Service actions have the potential to produce some form of impact, positive and/or negative, on the civil rights of individuals or groups, including minorities and women. The need to conduct an analysis of this potential impact is required by Forest Service Manual and Handbook direction. The purpose of the impact analysis is to determine the scope, intensity, duration, and direction of impacts resulting from a proposed action. For environmental or natural resource actions as proposed for the Ushk Bay Project, the civil rights impact analysis is an integral part of the procedures and variables associated with the social impact analysis. This analysis is discussed in the *Economics* section of this chapter.

The effect of the alternatives on consumers is reflected in the discussion of the various goods and services supplied as a result of the proposed actions. This analysis occurs throughout this chapter as an integral part of the analysis of the effects on other components of the environment.

Effects of Alternatives on Prime Farm Land, Rangeland, and Forest Land

All alternatives are in keeping with the intent of Secretary of Agriculture Memorandum 1827 for prime land. The Project Area does not contain any prime farm lands or rangelands. Prime forest land does not apply to lands within the National Forest system. In all alternatives, lands administered by the Forest Service would be managed with a sensitivity to the effects on adjacent lands.

Effects of Alternatives on Threatened and Endangered Species, and Critical Habitat

There will be no adverse impacts to any Federally listed threatened and endangered species or critical habitat as a result of this project. The humpback whale and the Steller sea lion are the two known threatened and endangered species that inhabit the Project Area. The discussion of the effects of the alternatives on threatened and endangered species is presented in the *Wildlife* section of this chapter.

Chapter 5

List of Preparers

Chapter 5
List of Preparers

Dames & Moore, Inc.

Susan Aha, Senior Environmental Scientist

MPH, Public Health, University of California, 1988
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Dames & Moore, Inc.: 2 years
Air Quality Analysis
Noise Analysis
Air Permits
Environmental Impact Statements
Project Manager

Other Employment:
Environmental Science Associates, Senior Associate (2 years)
Service Employees International Union, Assistant Health & Safety Coordinator (1 year)
Technica, International, Consultant (1 year)
Chevron U.S.A., Chemist (3 years)
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Vanessa Artman, Wildlife Biologist

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B.A., Biology, Earlham College, 1980

Dames & Moore, Inc.: 2 years
Environmental Impact Assessments
Terrestrial Ecology
Wildlife Habitat Assessments

Other Employment:
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B.S., Biology, University of Washington, 1990
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5 List of Preparers

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M.S., Civil Engineering, University of Alaska, 1987
M.S., Hydrology, University of New Hampshire, 1980
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Hydrology/Hydrogeology
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Arctic Hydrologic Consultants, Hydrologist (1/2 year)
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Ann Campbell, Graphics Illustrator

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Desktop Publishing
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TRA, Graphic Illustrator/Project Coordination (< 1 year)

J. Lane Cameron, Assistant Project Manager/Senior Marine Biologist

Ph.D., Marine Biology, Simon Fraser University, 1985
M.S., Zoology, Brigham Young University, 1980
B.S., Zoology, Brigham Young University, 1978

Dames & Moore Inc.: 3-1/2 years
Benthic Marine Ecologist
Project Manager
Environmental Impact Assessments
Data Analyst and Manager

Other Employment:
Harbor Branch Oceanographic Institution, Research Associate (4 years)

Sheri Confer, Botanist/Wetlands Biologist

M.A., Botany, Connecticut College, 1990
B.S., Botany, Oregon State University, 1987

Dames & Moore, Inc.: 2 years
Botany
Wetland Ecology

Other Employment:
U.S. EPA Research Lab, Wetland Scientist (1 year)
Connecticut College, Botanist (2 years)

Martin Y. DuLaney II, Graphics Group Leader

Illustrator Technician Course 223X1, USAF, 1970

Dames & Moore, Inc.: 5-1/2 years
Desktop Publishing
Computer Graphics
Graphic Design

Other Employment:
R. W. Beck and Associates (6 years)
John Fluke Manufacturing Co., Inc. (2 years)
Physio Control Corporation (2 years)
International Audio Visual (1 year)
Tally Corporation (2 years)
U.S. Air Force (4 years)

A. David Every, Project Manager / Senior Terrestrial Ecologist

Ph.D., Botany, University of Washington, 1977
M.S., Botany, University of Utah, 1969
B.S., Zoology, University of Utah, 1967

Dames & Moore, Inc.: 5 years
Project Management
Terrestrial Ecology
Wetlands Evaluations
Botany
Environmental Impact Assessments

Other Employment:
Envirosphere Company, Terrestrial Ecologist (5 years)
NUS Corporation, Terrestrial Ecologist (3 years)
Principal Investigator in various consulting capacities (1 year)

Sandra Flint, Staff Archaeologist

B.A., Anthropology, California State University, 1987

Dames & Moore, Inc.: 2 years
Cultural Resource Management
Resource Survey and Evaluation
Pacific Northwest Archaeology
California Archaeology

Other Employment:
Mountain Anthropological Research, Staff Archaeologist (2 years)
Coyote & Fox Enterprises, Staff Archaeologist (1 year)
California Department of Transportation, Assistant Archaeologist (1 year)
U.S. Forest Service, Archaeological Technician (1 year)

5 List of Preparers

Larry Frank, Environmental Planner

B.S., Landscape Architecture, Colorado State University, 1991

Dames & Moore Inc.: 1-1/2 years
Recreation Planning
Visual Resources
Land Use Management
GIS

Other Employment:
MPI, GIS Analyst (3 years)
Colorado Center for Community Development, Landscape Architecture (2 years)

Donna Frostholm, Biologist

B.S., Biology, Oregon State University, 1989
B.S., Journalism, Southern Illinois University, 1982

Dames & Moore, Inc.: 1-1/2 years
Environmental Impact Assessments
Wetland Biologist

Other Employment:
ManTech Environmental, Wetland Scientist (3 years)

Gregory Gault, Visual Resource/Recreation Planner

B.S., Landscape Architecture, Texas A&M University, 1984

Dames & Moore, Inc.: 6 years
Project Coordination
Visual Resources
Recreation Planning
Wilderness Values

Other Employment:
Nash-Phillips-Copus, Project Coordinator (2 years)

Leslie Howell, Environmental Planner

M.S., Geography, University of Idaho, 1989
B.S., Geography, University of Wisconsin, 1987

Dames & Moore, Inc.: 1 year
Visual Resources
Recreation Resources
GIS

Other Employment:
Ada County, GIS Analyst (1/2 year)
Boise National Forest, GIS Manager (1/2 year)
Resource Investigator for several small firms (2 years)

David Janis, Environmental Planner

M.A., Geography, University of Wyoming, 1976
B.G.S., Natural Sciences/Natural Resource Management, Ohio University, 1973

Dames & Moore, Inc.: 1 year
Permit Preparation and Analysis
SEPA/NEPA Compliance
Land Use, Socioeconomic and Public Service Analysis
Project Management
Environmental Planning

Other Employment:
Permit/Engineering, Inc., Environmental Specialist (3 years)
Montana Department of Natural Resources, Project Manager/Environmental Specialist (7-1/2 years)
Montana Department of State Lands, Environmental Coordinator (1 year)
Lincoln-Vinta Counties Planning Office, Land Use Planner (< 1 year)
Water Resource Research Institute, Researcher (1 year)

James E. Jensen, Visual Resource/Recreation Planner

M.A., Environmental Studies, Mankato State University, 1981
B.S., Landscape Architecture, South Dakota State University, 1976

Dames & Moore Inc.: 9 years
Project Management
Recreation Planning
Visual Analysis

Other Employment:
Wirth Associates, Landscape Architect (3 years)
City of Eden Plaine, Minnesota, Park Planner (3 years)

Ed Johnson, Assistant Project Manager/Forester

B.S., Forest Management, Michigan State University, 1963

Dames & Moore, Inc.: 3 years
Environmental Planning and Analysis
Project Management

Other Employment:
U.S. Forest Service, Forester (25 years)

Michael S. Kelly, Senior Archaeologist

M.A., Anthropology, University of Nevada, 1986
B.A., Anthropology, University of California, 1978

Dames & Moore, Inc.: 10 years
Cultural Resource Management
Pacific Northwest Archaeology
California Archaeology
Historical Archaeology

Other Employment:
Wirth Associates, Project Archaeologist (1 year)
U.S. Forest Service, Archaeological Technician (< 1 year)

5 List of Preparers

Richard R. Langendoen, Senior Geologist

B.S., Geology, Washington State University, 1979

Dames & Moore, Inc.: 4 years
Engineering Geology
Geologic Hazard Assessments
Environmental Documentation
Project Manager

Other Employment:
RZA/AGRA, Inc., Senior Geologist (8 years)
Foundation Sciences, Inc., Project Geologist (1 year)

Robert Mott, Consulting Economist

M.A., Economics, University of California, 1963
B.F.T., Foreign Trade, American Graduate School of International Management, 1957
B.A., Spanish, Michigan State University, 1956

Dames & Moore, Inc.: 15 years
Socioeconomics
Economic Feasibility Analysis
Regional Economic Modeling
Natural Resource Economics

Other Employment:
Self Employed Consulting Economist, 4 years
Westwood Research, Senior Economist (3 years)
SRI International, Staff Economist (2 years)
Central Intelligence Agency, Staff Economist (4 years)

Douglas Navetski, Oceanographer/Marine Biologist

B.S., Oceanography, University of Washington, 1985
B.S., Zoology, University of Washington, 1985
Dames & Moore, Inc.: 4 years
Physical and Biological Oceanography
Environmental Impact Assessments
Marine Environmental Investigations
Oil Spill Assessment and Monitoring

Other Employment:
ENSR, Oceanographer (1 year)
SAIC, Marine Technician (1 year)
Evans Hamilton, Oceanographer (1.5 years)
University of Washington, Marine Technician (1 year)

Geoff Pool, Environmental Planner

B.S., Landscape Architecture, University of Idaho, 1990
Dames & Moore, Inc.: 3 years
Recreation Resources
Land Use
Visual Simulation

Other Employment:
Frame Witte Landscape, Nurseryman (1 year)

Greg S. Reub, Senior Fisheries Biologist

M.A., Ecology & Systematic Biology, San Francisco State University, 1990
B.S., Wildlife & Fisheries, South Dakota State University, 1977

Dames & Moore, Inc.: 4 years
Fisheries Biology
Water Quality
Aquatic Ecology
Impact Assessment
Project Management

Other Employment:
Envirosphere Co., Senior Associate Biologist (2 years)
Trihey and Associates, Fisheries Biologist (2 years)
Woodward-Clyde Consultants, Staff Scientist (4 years)
Peace Corps, Aquatic Biologist (2 years)
Stearns Rogers, Inc., Junior Chemist (1 year)

Rusty Scalf, GIS Analyst

B.S., Soil Science, Washington State University, 1983
B.A., Geography, Dominguez Hill State College, 1976

Dames & Moore, Inc.: 2-1/2 years
GIS & Geographic Analysis

Other Employment:
Pacific Meridian Resources, Assistant GIS Manager (2 years)
Oakland Public Schools, Teacher (2 years)
Los Angeles Public Schools, Teacher (4 years)

Maureen Sims, Environmental Analyst/Public Involvement Specialist

English/Communications, Wright State University

Dames & Moore, Inc.: 1-1/2 years
Environmental Analysis
Land Use/Planner
Public Involvement
Property Transfer Assessments
Oil Spill Response Planning

Other Employment:
Storch Associates, Environmental Specialist (1-1/2 years)

Michael Stevens, GIS Manager/Senior Planner

M.A., Environmental Planning, San Francisco State University, 1981
B.A., Social Sciences, University of California, 1975

Dames & Moore, Inc.: 4 years
GIS
Natural Resources
Land Use Planning
Project Management

Other Employment:
U.S. Forest Service, Planner/GIS Coordinator (12 years)

5 List of Preparers

Peter L. Stroud, Project Geologist

B.A., Geology, Humboldt State University, 1978

Dames & Moore, Inc.: 5 years
Engineering Geology
Hydrology
Hydrogeology
Contaminant Studies
Remediation

Other Employment:
H.G. Schlicker & Associates, Associate Geologist (1 year)
Wm. Cotton & Associates, Senior Engineering Geologist (3 years)
California Nickel Corp., Exploration Manager (2 years)
Redwood National Park, Geomorphologist (1 year)
Associated Geologists, Exploration Geologist (2 years)

Douglas Washburn, Senior Geotechnical Engineer

M.C.E., Geotechnical Engineering, University of Alaska, 1992
B.Sc., Civil Engineering, University of Alaska, 1987
B.A., Geology, North Carolina State University, 1979
B.Sc., Physics, North Carolina State University, 1978
B.Sc., Applied Mathematics, North Carolina State University, 1978

Dames & Moore, Inc.: 4 years
Geotechnical Engineering
Geophysical Investigations
Geologic Investigations
Environmental Assessments

Other Employment:
Cold Regions Consulting Engineers, Geotechnical/Geophysical Engineer (3 years)
ARCO Alaska, Geophysicist (1 year)
Analunda Minerals, Geophysicist (4 years)

Greg White, Fisheries Biologist/Oceanographer

M.S., Oceanography, Old Dominion University, 1991
B.S., Fishery Science, New Mexico State University, 1986

Dames & Moore, Inc.: 2 years
Fisheries
Oceanography
Toxicology
Aquatic Biology Surveys

Other Employment:
Applied Marine Research Lab, Oceanographer/Toxicologist/Chemist (4 years)
Old Dominion University, Fishery Biologist/Oceanographer (2 years)
New Mexico University, Fishery Biologist (1 year)

U.S. Forest Service

Michael J. Weber, Contract Officers Representative/Forest Service IDT Team Leader

M.S., Wildlife Biology, South Dakota State University, 1978
B.S., Wildlife Conservation, University of Missouri, 1975

U.S. Forest Service: 15 years
Wildlife Biologist

Other Employment:
South Dakota State University, Wildlife Research Assistant (2 years)

Michael Regan, Planning Forester

B.S., Forest Management, University of Tennessee, 1975

U.S. Forest Service: 14 years
Forester

Joseph E. Costa, Transportation Planner

B.S., Botany, Chico State University, California, 1969
A.A., Civil Engineering Technology, Shasta College, California, 1967

Forest Service: 24 years
Transportation Planner
District Engineer

Wessen & Associates

Gary Wessen, Senior Archaeological Consultant

Ph.D., Anthropology, Washington State University, 1982
M.A., Anthropology, Washington State University, 1975
B.A., Anthropology, City University of New York, 1973

Wessen & Associates: 10 years
Northwest Coast Archaeology
Faunal Analysis
Resource Survey and Evaluation

Other Employment:
Makati Cultural Resource Center, Staff Archaeologist (10 years)

Logging Engineering International

Dallas C. Hemphill, Logging and Transportation Lead

M.Sc., Forestry, University of British Columbia, 1970
B.Sc., Botany, Auckland University, 1967

Logging Engineering International, Inc.: 12 years
Logging Engineering
Transportation Analysis

Other Employment:
Weyerhaeuser Co., District Engineer/Contract Supervisor/Project Manager (5 years)
Fletcher Timber Co., Logging Engineering (3 years)
New Zealand Forest Service, Logging Planner (3 years)

5 List of Preparers

Mason, Bruce & Girard

Carl Newport, Forest Economist

Ph.D., Forestry Economics, New York State College of Forestry, 1954
M.S., Forest Engineering & Management, Oregon State University, 1950
B.S., Forestry, University of Michigan, 1948

Mason, Bruce & Girard: 26 years
Forest Management & Policy
Forestry Economics
Forest Valuation
Biometrics

Other Employment:
U.S. Forest Service, Research Director/Research Economist/District Forester (15 years)
Colorado State University, Professor - Forest Economics (5 years)

Stuart T. Smith, Silviculturist

B.S., Forest Management, University of Washington, 1964

Mason, Bruce & Girard, Inc.: 4 years
Silviculture
Timber Appraisal

Other Employment:
Santa Fe Pacific Timber Co., Director of Corporate Development/Manager of Research & Silviculture (9 years)
Southern Pacific Land Co., District Manager (2 years)

Photo Contributors

U.S. Forest Service Photo Files
Logging Engineering International
Vanessa Artman
David M. Bjerklie
J. Lane Cameron
A. David Every
Gregory Gault
Douglas Navetski
Greg S. Reub
Tim Viel

Chapter 6

List of Agencies, Organizations and Persons to Whom Copies of this Statement Were Sent

Chapter 6

List of Agencies, Organizations and Persons to Whom Copies of this Statement Were Sent

Individuals Sent Quick Review Copy of Final EIS

Abrahamson, Jeffrey E.

Adams, Dale L.

Alexander, Karen

Alsup, Paul R.

Angerman, Fred

Angerman, J.R.

Arnold, Bill and Marcia

Bache, Ralph A.

Bailey, Richard A.

Barrow, Karen

Barstad, Crystal

Begareath, Al

Behnken, Nancy and Gregg Jones

Bell, Jackie

Bell, Mike

Berry, Paul

Binkler, Dick

Blevins, Eric

Blinton, Rollard

Blundell, Gail

Boekman, Noah

Booker, Dennis H.

Bottoms, Wayne

Bowe, Gary G.

Brabender, Jack

Brenner, Steve

Brink, Kim

Brock, Drake and Lavina

Bruneff, T.R.

Brylinsky, Scott

Buhler, Georgianna

Bunch, Genevieve

Buness, Olive

Burdett, Betsey

Campbell, L.T. and Lynne

Campbell, Carl

Capps, Kevin and Tracy

Carper, Curtis and James

Casey, Dee

Christian, Brian and Kim

Cleman, Michael and Deanna

Clengeman, Leonard

Clough, Raymond G.

Coats, Gary and Sara

Cochran, Claire and Noel Johnson

Cogburn, Bob

Colli, James W.

Collins, J.

Colton, James and Patty

Comstock, Glenda

Cottingham, David

Crist, Q.R.

D'Arienzo, Joe

Darin, David

David, Jerry

Davidson, M.E.

Davis, Nancy

Dennison, Brad

Dick, Ronn

Drury, Helen M.

Dunaway, Delmar

Dzugan, Jerry

Ellis, John

Emmeny, Clayton and Mary

Erroh, Charlie

Etulain, Dan

Evans, Mandy

Evensen, James A.

Farnell, Dick

Fernandez, Andrew E.

Fisher, Stanley E.

Fordzen, Randall M.

Gabriel, John P.

Gangler, Richard M.

Gardner, Jess

Gardner, Alan

Garrison, L. Dean

Gerle, Kelly

Gibson, G.J.

Gilbert, John R.

Ginn, Robert A.

Graham, Owen J.

Grant, Travis and Tyler

Gronhong, Ralph C.

Gross, Alice E.

Gulick, Darlene

Hames, Lloyd and Barbara

Hammonuu, C., Debbie Stilson, Tammee Hansen, and Jeff Serfert

Hansen, H.

Harder, Susan M.

Hartmann, Carl J.

Heath, Tom

Hein, Roger and Pat

Helen, Mary

Helena, Theresa

Himschoot, Rebecca

Hinkler, William H., Jr.

Hitcher, Steven, G.K. Hilan, K. Berman, Susan Sina, Tom Sina, and William E. Jelley

Hobart, Charles

Holle, Eric

Holman, Teryl M.

Hosier, Mary Lou

House, P.

Huffman, Raymond L.

Hughes, Marin

Iverson, Kurt

Jackson, James

Jacobsen, T.E.

James, Allen

Johnson, Larry and Kelly

Johnson, Wayne

Johnson, Michael D.

Jones, Marc R.

Jordan, Sarah

Jordan, Todd

Kangas, Charles

Karpstein, Terri

Keck, Dan and Betty

Keene, Pat

Kent, Chris S.

Keso, Dorren

Kihs, Thomas

King, James E.

Kirchoff, Mark J.

Kirschner, Mike and Kathi

Knauer, Larry

Lamberty, Dwight

Landry, Leo J.

Larsen, Larry

Larson, Loyd M.

Lawson, John

Le, Khoi

Leccese, Michael and family

Lee, Warren

Lehmer, Chris

Lepschat, Norman

Leslie, Wilma E.

Linton, Chuck E.

Littlefield, John

Lofftus, Robert E.

Machaler, Petr, Louise Lindley, and Janna Machaler

Martin, Syd and Jeannie

Maxans, Robert

Mays, James R. and Vinita L.

McCabe, John

McCarty, Cliff

McClurry, D.W.

McGill, Joanne J.

McNelly, Audrey

McNelly, Anna

Meissner, Charles

Merrell, Ted

Miller, Billy Jo

Miller, Pearl L.

Miller, Dave

Miller, Shirley, Loren L. Erpelding, and O. Moore

Minn, Beverly P.

Morain, Andy

Morris, Joy

Nauman, E. Robert and Barbara

Neilson, John

Newman, Darren

Newman, David

Nichol, Harold P.

Nielsen, Ray, Jr.

Nielson, Lyle and Patricia

Nore, Robert, M.

O'Connell, Tory

O'Hara, James

Oetken, E.R.

Oliver, Tim

Olson, Wallace M.

Owens, Becky J.

Parker, Eric and Catherine

Pate, Jude

Patty, Leon

Philife, J.F.

Phillips, Ronald P.

Polinkus, Brian

Powers, Mr. and Mrs. Danny R.

Powers, Susan K.

Raichl, Andrej and Monica

Rasler, Randy L.

6 List of Agencies, Organizations and Persons to Whom Copies of this Statement Were Sent

Ray, David D., Sr.
Rehfeldt, Jim
Resturg, William
Richards, Barbara R.
Rims, Marshall
Riste, Al
Rivers, John W.
Rosenbruch, Jimmie C.
Roshut, Todd
Routh, Sharon
Russell, James R., Jr.
Schmidt, Lee M.
Scott, Paula
Shaffer, Betty A.
Sheffer, Cathy
Shirley, Jacqueline, G.
Smith, Alana
Smith, Loretta R.
Smith, Pete
Smith, Robert C.
Stauffer, Steve
Stedman, Ken, Bonita, and Karl
Stidham, Kenneth
Stockemer, Paul
Stonelake, Robin E.
Stortz, William A.
Stratton, Jim
Streveler, Greg
Teasly, Gary L.
Thomas, R.E.
Thomsen, Dorothy
Thurston, Fred and Carolee
Tonant, Stanley R.
Trani, Larry
Trotter, Helen
Truitt, Gil
Turner, Jim
Turner, Kile and Kirby
Twohig, Pamela
Vantrease, Kenneth, Glenn, and Scott
Venneberg, Ed
Venneberg, Mike
Vennetti, Joan G.
Wallace, Sally
Ward, Marjorie L.
Watson, Bonnie J.
Weatherly, Larry J.
Weimann, Barbara
Welsh, Ron
Westburg, Edward R.
White, Tracy
White, Jerry Dean
White, Walter E.
White, Clifford
Whitson, Robert
Williams, Gordon
Willman, Mary
Wilson, Holly
Wilson, Jack W.
Wirth, Roland
Wolfe, Sylvia Ellen
Womack, James, Shirley, and Todd
Woolsey, Robert
Wright, Brenda

Individuals Sent Complete Copy of Final EIS

Ady, Linda Marie

Allen, Randy

Bachie, Ralph

Brakel, Judy

Carr, Peter

Edwards, Larry

Else, Page

Flynn, Kurt

Gasaway, Duane H.

Gates, Paul

Geddie, John

Gordon, David A.

Hamby, Paul

Hammons, Kenneth J.

Hitch, Audrey

Joensuu, Pat

Iverson, Kurt

Jacobs, Mark

Korthals, Kurt M.

Katz, Dave

Kirschner, Michael and Kathi

Kitka, Herman

Lindgren, Heidi

Lowe, Ann L.

Mackovjak, James R.

Malewski, Ed and Jennifer

Martin, Arnold

Mehrkens, Joseph R.

Metcalf, K.J.

Mitchell, B.

Motto, Chris

Muller, Don

Nelson, Richard

Nevers, Foy

Nielsen, James J.

Nielsen, J.S.

Nielsen, R.S. Jr.

Pool, Rollo, Christine, and Megan

Richards, Norman J.

Ronn, Dick

Sams, Roger

Sapinoro, Ray J.

Sarff, Jerald

Skoog, Christopher

Stahla, Edward A.

Stedman, Bert K.

Stredwick, Robert

Van Epps, Charles P.

Widmark, L.A.

Wilson, Albert W. and M. Signe

Wilson, Harry E.

Woodall, Gary C.

Wright, Ted A.

Young, Vicki

Zamzow, Henry

6 List of Agencies, Organizations and Persons to Whom Copies of this Statement Were Sent

Agencies and Organizations Sent Quick Review Copy of Final EIS

Alaska F&G Advisory Committee,

Chairman, Elfin Cove Committee

Alaska F&G Advisory Committee, Chairman, Gastineau Channel

Alaska F&G Advisory Committee, Chairman, Hoonah Committee

Alaska F&G Advisory Committee, Chairman, Kake Committee

Alaska F&G Advisory Committee, Chairman, Ketchikan Committee

Alaska F&G Advisory Committee, Chairman, Klukwan Committee

Alaska F&G Advisory Committee, Chairman, Pelican Committee

Alaska F&G Advisory Committee, Chairman, Petersburg Committee

Alaska F&G Advisory Committee, Chairman, Port Alexander Committee

Alaska F&G Advisory Committee, Chairman, SE Regional Council

Alaska F&G Advisory Committee, Chairman, Sumner Strait Committee

Alaska F&G Advisory Committee, Chairman, Tenakee Springs Committee

Alaska F&G Advisory Committee, Chairman, Upper Lynn Canal Committee

Alaska F&G Advisory Committee, Chairman, Wrangell Committee

Alaska Native Brotherhood, Camp #1 President

Alaska Native Brotherhood, Camp #10 President

Alaska Native Brotherhood, Camp #7 President

Alaska Native Brotherhood, Grand Camp President

Alaska Native Sisterhood, Camp #10 President

Alaska Native Sisterhood, Camp #7 President

Alaska Native Sisterhood, Camp #76 President

Alaska Native Sisterhood, Grand Camp President

Alaska Pulp Corporation

Alaska State Representative

American Fisheries Society, Executive Director

American Fishing Tackle Manufacturers Association

American Rivers

Atlantic States Marine Fish Commission

Bass Anglers Sportsman Society, Environmental Director

Center for Marine Conservation

City & Borough of Sitka

City of Angoon

City of Hoonah

City of Pelican

City of Tenakee Springs

City of Wrangell

Int. Assoc. F&W Agencies, Resource Specialist

Izaak Walton League of America, Executive Director

KCAW-Raven Radio

Kootznoowoo, Inc., Resource Manager

Lake Superior Center

Landau & Assoc. Inc.

National Audubon Society

National Wildlife Federation

Natural Resources Advisory Committee

Petersburg Chamber of Commerce

Silver Bay Logging

Sitka Chamber of Commerce

Sitka Tribe of Alaska

Soderburg Logging & Const.

Southeast Conference, Executive Director

Sport Fishing Institute, Vice President

The Boat Co., Ltd.

Trout Unlimited, Resource Director

U.S. Representative

U.S. Senator

USDI National Park Service, Sitka National Historical Park

W.R. Tonsgard Logging

Whitestone Logging Co.

Wildlife Management Institute

Wrangell Chamber of Commerce

Agencies and Organizations Sent Complete Copy of Final EIS

AK Dept of Commerce & Econ Develop, Division of Economic Development

AK Dept of Environ Conservation, Sitka District Office

AK Dept of Fish & Game, Division of FRED

AK Dept of Fish & Game, Division of Habitat

AK Dept of Fish & Game, Division of Subsistence

AK Dept of Fish & Game, Division of Wildlife Conservation

6 List of Agencies, Organizations and Persons to Whom Copies of this Statement Were Sent

AK Dept of Fish & Game, Sitka Office, Habitat Division

AK Dept of Fish & Game, Sitka Office, Sport Fish Division

AK Dept of Fish & Game, Sitka Office, Wildlife Conservation

AK Dept of Natural Resources, Division of Forestry

AK Dept of Natural Resources, Division of Land

AK Dept of Natural Resources, Division of Parks & Outdoor Rec

AK Dept of Natural Resources, State Historic Preservation Officer

AK Office of Management & Budget, Div. of Governmental Coordination

Alaska Forest Association

Alaska Land Use Council

Alaska Miner's Assoc.

Alaska Pulp Corp., Woods Division, Engineer

Alaska Pulp Corporation

Alaska Pulp Corporation, Hoonah Field Office

Alaska Pulp Corporation, Lumber Division

Alaska Pulp Corporation, Timber Operations, Vice President

Baidarka Boats

City & Borough of Sitka, Coastal Mgmt. Coordinator

City of Angoon, ACMP Coordinator

City of Tenakee Springs

Federal Energy Regulatory Commission, Advisor on Environmental Quality

Glacier Guides, Inc.

HARZA Northwest

Kettleson Memorial Library

Logger's Legal Defense Fund

N.C. Machinery

Northern Credit Services

Pentec Environmental

Robertson, Monagle & Eastaugh

SE Native Subsistence Commission

SEACC, Executive Director

Shaffer & Harrington

Sheldon Jackson College, Stratton Library

Sierra Club Legal Defense Fund

Sierra Club, Juneau Group

Sitka Conservation Society

US Advis. Council on Historic Pres., Office of Arch. & Environ. Preserv.

US Army Corps of Engineers, Headquarters, Attn: DAEN-ZCE

US Army Corps of Engineers, Regulatory Branch

US Department of Commerce, NOAA, Ecology & Conservation Division

US Department of Commerce, NOAA, National Marine Fisheries Service

US Department of the Interior, Environmental Project Review

US Environmental Protection Agency, Alaska Operations Office

US Environmental Protection Agency, EIS Review Coordinator, Region X

US Environmental Protection Agency, Office of Environmental Review

US Fish & Wildlife Service

US Fish & Wildlife Service

US Fish & Wildlife Service, Regional Director

USDA Forest Service, Forest Service Library

USDA Forest Service, Office of Environmental Coordination

USDA Forest Service, Tongass NF, Ketchikan Area

USDA Forest Service, Tongass NF, Stikine Area

USDA Forest Service, Wrangell Ranger District

USDA Soil Conservation Service, Environmental Coordinator

University of Alaska, Anchorage, Institute of Soc. & Econ. Research

Wrangell Forest Products Ltd.

Chapter 7

Literature Cited

Literature Cited

Ackerman, R.E. 1975. Report to the U.S. Forest Service: Archaeological Reconnaissance of Areas Under Survey for Five Year Cutting Proposal, A.L.P. (August 1 - September 15, 1974). M.S. on file, Tongass National Forest, Chatham Area Supervisor's Office, Sitka, Alaska.

Alaback, P.B. 1984. Plant Succession Following Logging in the Sitka Spruce-Western Hemlock Forests of Southeast Alaska: Implications for Management. USDA Forest Service General Technical Report PNW-173. Pacific Northwest Forest and Range Experimental Station, Portland, Oregon.

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___________. 1992b. Alaska Industry — Occupation Outlook to 1995.

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Armstrong, R.H. 1990. Guide to the Birds of Alaska. Third Edition. Alaska Northwest Books, Anchorage, Alaska.

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Artman, V. 1992. Wildlife Resource Inventory Report. Dames & Moore, Seattle, Washington.

Assam, M. 1992. Social and Economic Environmental Resource Inventory Report. Dames & Moore, Seattle, Washington.

Assam, M. and R. Mott. 1993. Social and Economic Environmental Consequences Report. Dames & Moore, Seattle, Washington.

Autrey, John T. 1992. Draft 2 Research Design/Predictive Model Format for R-10. Manuscript on file, Tongass National Forest, Chatham Area Supervisor's Office, Sitka, Alaska.

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Chapter 8

Glossary

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Glossary

Acronyms used in Text

ACMP	Alaska Coastal Management Program
ADF&G	Alaska Department of Fish and Game
AHMU	Aquatic Habitat Management Unit
ANCSA	Alaska Native Claims Settlement Act of 1971
ANILCA	Alaska National Interest Lands Conservation Act of 1980
APC	Alaska Pulp Corporation
ATV	All-Terrain Vehicle
BLM	Bureau of Land Management
BMP	Best Management Practice
CFL	Commercial Forest Land
CFR	Code of Federal Regulations
COE	Army Corps of Engineers
CZMA	Coastal Zone Management Act of 1976
DBH	Diameter at Breast Height
DEIS	Draft Ushk Bay Environmental Impact Statement
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EVC	Existing/Expected Visual Condition
FEIS	Final Ushk Bay Environmental Impact Statement
FPA	Forest Practices Act
FSH	Forest Service Handbook
FTE	Full-time Equivalent
GIS	Geographic Information System
GMU	Game Management Unit
IDT	Interdisciplinary Team
KV	Knutsen-Vandenberg Act
LTF	Log Transfer Facility
LUD	Land Use Designation
LWD	Large Woody Debris
M	Modification

8 Glossary

MA	Management Area
MBF	One thousand board feet
MIS	Management Indicator Species
MM	Maximum Modification
MMBF	One million board feet
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act of 1969 (as amended)
NFMA	National Forest Management Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
ORV	Off Road Vehicle
P	Preservation
PR	Partial Retention
PRIM	Primitive
R	Retention
RM	Roaded Modified
RMO	Road Management Objective
RN	Roaded Natural
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RVD	Recreation Visitor Day
SHPO	State Historic Preservation Officer
SPM	Semi-Primitive Motorized
SPNM	Semi-Primitive Non-Motorized
TDS	Total Dissolved Solids
TLMP	Tongass Land Management Plan
TRUCS	Tongass Resource Use Cooperative Survey
TTRA	Tongass Timber Reform Act
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
VCU	Value Comparison Unit
VQO	Visual Quality Objective
WAA	Wildlife Analysis Area

Terms used in Text

Alaska Lumber and Pulp Corporation

Now named Alaska Pulp Corporation (APC).

Alaska National Interest Lands Conservation Act (ANILCA)

Passed by Congress in 1980, this legislation designated 14 National Forest wilderness areas in Southeast Alaska. In section 705(a) Congress directed that at least $40,000,000 be made available annually to the Tongass Timber Supply Fund to maintain the timber supply from the Tongass National Forest at a rate of 4.5 billion board feet per decade. Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

Alaska Native Claims Settlement Act (ANCSA)

Approved December 18, 1971, ANCSA provides for the settlement of certain land claims of Alaska natives and for other purposes.

Alaska Pulp Corporation (APC)

Previously Alaska Lumber and Pulp Corporation

All-terrain Vehicle (ATV)

A wheeled vehicle less than 40 inches wide

Allowable Sale Quantity (ASQ)

ASQ refers to the maximum quantity of timber that may be sold each decade from the Tongass National Forest. This quantity expressed as a board foot measure is calculated per timber utilization standards specified in the Alaska Regional Guide, the number and type of acres available for timber management, and the intensity of timber management. The ASQ was calculated at 4.5 billion board feet per decade for the Tongass National Forest.

Alpine Habitat

The area over 1,500-foot in elevation.

Anadromous Fish

Anadromous fish spend part of their lives in fresh water and part of their lives in salt water. Anadromous fish include pink, chum, coho, sockeye, and king salmon, and steel head and cutthroat trout. There are also anadromous Dolly Varden Char.

Analysis Area

An analysis area is a planning unit made up of two or more management areas identified in the Tongass Land Management Plan. This grouping of management areas is consistent with the area analysis direction found in the 1985-86 Tongass Land Management Plan Amendment.

Appraisal

See Timber Appraisal.

Aquatic Habitat Management Unit (AHMU)

A mapping unit that displays an identified value for aquatic resources. It is a mechanism for carrying out aquatic resource management policy.

> *Class I AHMU*: Streams with anadromous or high quality sport fish habitat. Also included is the habitat upstream from a migration barrier known to have reasonable enhancement opportunities for anadromous fish.
>
> *Class II AHMU*: Streams with resident fish populations and generally steep (6 to 15 percent) gradient (can also include streams from 0 to 6 percent gradient where no

anadromous fish occur). These populations have limited sport fisheries values and are separate from the high quality sport fishing systems included in Class I. They generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use.

Class III AHMU: Streams with no fish populations but have potential water quality influence on the downstream aquatic habitat.

Arterial Road

A forest road that provides service to large land areas and usually connects with other arterial roads or public highways.

Beach Fringe Habitat

Habitat that occurs from the intertidal zone inland 500 feet, and islands of less than 50 acres.

Benthic Habitat

The substrate and organisms on the bottom of marine environments.

Best Management Practice (BMP)

A practice or combination of practices that, after problem assessment, examination of alternative practices, and appropriate public participation, is determined by a state to be the most effective and practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. A BMP is not a site-specific prescription but an action-initiating mechanism which eventually leads to the interdisciplinary development of a site-specific prescription.

Buffer

Tongass Timber Reform Act requires that timber harvest be prohibited in an area no less than 100 feet of uncut timber in width on each side of all Class I streams and Class II streams which flow directly into Class I streams. This 100-foot area is known as a buffer.

Cant

A log partly or wholly cut and destined for further processing.

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.

Collector Road

A forest road that serves smaller land areas than an arterial road. Usually connects forest arterial roads to forest local roads or terminal facilities. Collector roads are usually long term facilities.

Commercial Fishery

Fish, shellfish, or other fishery resources taken or possessed within a designated area for commercial purposes.

Commercial Forest Land (CFL)

Productive forest land that is producing or capable of producing stands of industrial wood and is not withdrawn from timber utilization by statute or administrative regulation. This includes areas suitable for management and generally capable of producing in excess of 20 cubic feet per acre of annual growth or in excess of 8,000 board feet net volume per acre. It includes accessible and inaccessible areas.

Standard CFL: Timber that can be economically harvested with locally available logging systems such as highlead or short-span skyline.

Nonstandard CFL: Timber that cannot be harvested with locally available logging systems and would require the use of other logging systems such as helicopter or long-span skyline.

Conveyance

The passing of the title of a property from one owner to another.

Cruise

Refers to the general activity as opposed to a specific method of determining timber volume and quality.

Cultural Resources

Historic or prehistoric objects, sites, buildings, structures, and their remains that result from past human activities.

Cumulative Effects

Impacts on the environment resulting from the addition of the incremental impacts of past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions occurring over time.

Direct Employment

Jobs that are immediately associated with the Long-Term Contract timber sale including, for example, logging, sawmills, and pulp mills.

Dispersed Recreation

Recreational activities that are not confined to a specific place.

Draft Environmental Impact Statement

A statement of environmental effects for a major Federal action which is released to the public and other agencies for comment and review prior to a management decision. An environmental impact statement is required by Section 102 of the National Environmental Policy Act (NEPA).

Estuary Fringe Habitat

The area within 1,000 feet of the mean high water line along an estuary.

Estuary

The relatively flat intertidal and upland areas generally found at the heads of bays and mouths of streams. Estuaries are predominantly mud and grass flats and are unforested except for scattered spruce or cottonwood.

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. Clearcutting is an example of this type of management.

Existing Visual Condition (EVC)

The level of visual change in the scenic quality of the natural landscape that is currently present on the ground is described as Existing Visual Condition. EVC indicates the level of change that is perceptible at the time a landscape is inventoried. EVC is used in identifying visual resource issues, analyzing landscapes to determine their condition relative to their VQO or other management direction, estimating the potential cumulative effects of management activities, monitoring the progress of landscape recovery from management activities, and recording a history of the degree and quantity of physical alteration that has occurred in a landscape. A series of six designations are used to describe the landscape, ranging from untouched to intensively modified:

Type I: Landscapes where only ecological change has taken place, except for trails needed for access. These landscapes appear to be untouched by human activities (natural).

Type II: Landscapes where changes are not noticed by the average forest visitor, unless pointed out. Landscapes that have been altered but changes are not perceptible.

Type III: Landscapes where changes are noticeable by the average forest visitor, but they do not attract attention. The natural appearance of the landscape remains dominant. Changes appear to be minor disturbances.

Type IV: Landscapes where changes are easily noticed by the average forest visitor and may attract attention. Changes appear as disturbances but resemble natural patterns in the landscape.

Type V: Landscapes where changes are very noticeable and would be obvious to the average forest visitor. Changes tend to stand out dominating the view of the landscape, yet they are shaped to resemble natural patterns when viewed from middleground or background distance zones.

Type VI: Landscapes where changes are in glaring contrast to the landscape's natural appearance. Changes would appear as dramatic, large-scale disturbances that would strongly affect the average forest visitor.

Fish Habitat

The aquatic environment and the immediately surrounding terrestrial environment that combined afford the necessary physical and biological support systems required by fish species during various life stages.

Floodplain

The lowland and relatively flat areas joining inland and coastal waters including debris cones and flood-prone areas of offshore islands; including at a minimum that area subject to a 1 percent (100-year recurrence) or greater chance of flooding in any given year.

Forbs

Any herb that is not a grass or is not grasslike.

Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA)

Amended in 1976 by the National Forest Management Act.

Forested Habitat

All areas with 10 percent or more forest cover. Includes old-growth, second-growth, commercial, and noncommercial forest land. Used in this EIS to represent a general habitat type.

Geographic Information System (GIS)

GIS is an information processing technology to input, store, manipulate, analyze, and display spatial and attribute data to support the decision making process. It is a system of computer maps with corresponding site-specific information that can be electronically combined to provide reports and maps.

Habitat Capability

The number of healthy animals that a habitat can sustain.

Indirect Employment

The jobs in service industries that are associated with the Long-Term Contract timber sale including, for example, suppliers of logging and milling equipment.

Interdisciplinary Team (IDT)

A group of people with different backgrounds assembled to solve a problem or perform a task.

Intermittent Roads

Roads developed and operated for periodic services and closed for more than one year between periods of use.

Knutsen-Vandenberg Act (KV)

This Act was passed by Congress in 1930 and amended in 1976 to provide for reforestation, resource protection, and improvement projects in timber sale areas. These funds are collected as a portion of the stumpage fee paid by the purchaser. Examples of such projects are stream bank stabilization, fish passage structures, and wildlife habitat improvement.

Land Use Designation (LUD)

The method of classifying land uses presented in the Tongass Land Management Plan (TLMP). Land uses and activities are grouped to define, along with a set of coordinating policies, a compatible combination of management activities. The following is a description of the four classifications:

> *LUD I*: Wilderness areas.
>
> *LUD II*: These lands are to be managed in a roadless state in order to retain their wildland character, but this designation would permit wildlife and fish habitat improvement as well as primitive recreation facility and road development under special authorization.
>
> *LUD III*: These lands may 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.
>
> *LUD IV*: These lands provide opportunities for intensive resource use and development where the emphasis is primarily on commodity or market resources.

Large Woody Debris (LWD)

Any large piece of relatively stable woody material having a least diameter of greater than four inches and a length greater than three feet that intrudes into the stream channel.

Layout

Planning and mapping (using aerial photos) of harvest and road systems needed for total harvest of a given area.

Local Road

A forest road that connects terminal facilities with forest collector, forest arterial or public highways. Usually forest local roads are single purpose transportation facilities and can either be long or short term in nature.

8 Glossary

Log Transfer Facility (LTF)

A facility that is used for transferring commercially harvested logs to and from a vessel or log raft or the formation of a log raft. It is wholly or partially constructed in waters of the United States, and siting and construction are regulated by the 1987 Amendments to the Clean Water Act. Formerly termed "terminal transfer" facility.

Long-term Road

Roads developed and operated to provide either continuous or intermittent access for long-term land management and resource utilization needs.

Management Area

An area one or more VCUs in size for which management direction was written in the Tongass Land Management Plan.

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.

Mitigation

These measures include avoiding an impact by not taking a certain action or part of an action, minimizing an impact by limiting the degree or magnitude of an action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources or environments.

National Environmental Policy Act (NEPA)

Passed by Congress in 1969, NEPA declared a national policy to encourage productive harmony between humans and their environment to promote efforts that will prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of humans to enrich the understanding of the ecological systems and natural resources important to the nation and to establish a Council on Environmental Quality. This act requires the preparation of environmental impact statements for federal actions that are determined to be of major significance.

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.

Nonforest Land

Land that has never supported forests and lands formerly forested but now developed for nonforest uses or land with less than 10 percent cover of commercial tree species.

Notice of Intent (NOI)

A notice printed in the Federal Register announcing that an Environmental Impact Statement will be prepared.

Operating Area

Areas within APC contract boundary area where the Forest Service designates units and roads in which timber may be cut or built to meet contract commitment.

Old-growth Forest

Ecosystems distinguished by old trees and related structural attributes. Old growth encompasses the later stages of 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 of an old-growth ecosystem will be influenced by its stand size and landscape position and context.

Operating Plan

Five-year plan for logging, road construction, and related activities under Federal Government contract with the APC.

Overstory

In a stand with several vegetative layers the overstory is the uppermost layer usually formed by the tallest trees.

Pole/Young Sawtimber Stage

The stage following timber harvest when canopy closure decreases the amount of light that reaches the forest floor and is associated with a rapid reduction in understory biomass. Usually 20 to 80 years after timber harvest.

Pond Value

The selling value of timber without the manufacturing cost.

Potential Yield

The potential yield for the next ten years is the maximum harvest that is possible given the optimum perpetual sustained-yield harvesting level attainable with intensive forestry on regulated areas and considering productivity of the land, conventional logging technology, standard silvicultural treatments, and relationships with other resource uses and the environment.

Precommercial Thinning

The practice of removing some of the trees of less than marketable size from a stand in order to achieve various management objectives.

Recreation Opportunity Spectrum (ROS)

The framework for planning and managing the recreation resource that consists of six classes from primitive to urban. Each ROS class is defined in terms of its setting and the recreational experiences offered in that setting. Other factors including the extent to which the natural environment has been modified, the type of facilities developed, and the degree of outdoor skills needed to enjoy the area, also play a role in defining the ROS class.

> *Primitive I*: Includes areas out of sight and sound of human activities and greater than 3 miles from roads open to public travel and marine travelways. Provides opportunities for a high degree of interaction with the natural environment, challenge risk, and the use of outdoor skills.
>
> *Primitive II*: Area is similar in appearance to Primitive I ROS class; however, is accessible by marine travelway or is within ½ mile of low-use trails.
>
> *Semi-Primitive Nonmotorized*: Includes areas greater than ½ mile and less than 3 miles from all roads, trails, or readily accessible marine travelways. Provides limited opportunities for isolation from the sights and sounds of humans and a high degree of interaction with the natural environment, moderate-challenge risk, and the opportunity to use outdoor skills.

Semi-Primitive Motorized: Includes areas less than ½ mile from primitive roads, trails, or readily accessible marine travelways. Characterized by a predominantly unmodified natural environment with minimum evidence of sights and sounds of humans. Road access is not maintained in these areas.

Roaded Natural: Areas are less than ½ mile from roads open to public travel, major power lines, and areas of timber harvest. Areas are characterized by predominantly natural environments with moderate evidence of sights and sounds of humans.

Roaded Modified: Areas are less than ½ mile from timber harvest and transportation corridors. Areas are characterized by modified natural environment where utilization practices are common and are for purposes other than recreation.

Rural: Includes those areas with small communities, developed campgrounds, and administrative sites. These areas are characterized by substantially modified natural environments. Sights and sounds of humans are readily evident.

Urban: Areas characterized by substantially urbanized environment. The back ground may have elements of a natural environment. Timber harvest activities and utilization practices are common. Sights and sounds of humans predominant. Large numbers of visitors can be expected on site and in nearby areas.

Recreation Places

Identified geographic 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, or the immediate area surrounding a lake, cabin site, or campground.

Recreation Sites

Specific locations used for recreational activities such as a specific anchorage, campsite or trail. There may be one or more recreation sites within a recreation place.

Resident Fish

Fish that are not anadromous and that reside in fresh water on a permanent basis. Resident fish include non-anadromous Dolly Varden char and cutthroat trout.

Riparian

Areas immediately adjacent to a body of water the vegetation of which is usually influenced by the water.

Road Management Objective (RMO)

Defines the intended purpose of an individual road based on Management Area direction and access management objectives. Road management objectives contain design criteria, operation criteria and maintenance criteria. Long-term and short-term roads have RMOs.

Road Prism

The area taken out of production from the top of the cut or toe of the fill on one side of a road to the top of the cut or toe of the fill on the other side of the road.

Roads, Specified

A road, including related transportation facilities and appurtenances, shown on the Sale Area Map and listed in the Timber Sale Contract.

Roads, Temporary

For National Forest timber sales, temporary roads are constructed to harvest timber on a one-time basis. These logging roads are not considered part of the permanent forest transportation network and have stream crossing structures removed, erosion measures put into place, and the road closed to vehicular traffic after harvest is completed.

Sawlog

A tree at least nine inches in diameter of breast height and greater than 33 1/3 percent sound usable wood (i.e., usable for industrial wood products).

Second-Growth Forest

Even-aged stands that grow back on a site after removal of the previous timber stand.

Seedling/Sapling Stage

The stage following timber harvest when most of the colonizing tree and shrub seedings become established. Usually 1 to 25 years.

Sensitivity Level

The measure of people's concern for the scenic quality of the National Forests. In 1980 the Tongass National Forest assigned sensitivity levels to land areas viewed from boat routes and anchorages, plane routes, roads, trails, public use areas, and recreation cabins.

> *Level 1*: Includes all areas seen from primary travel routes, use areas, and water bodies where at least three-fourths of the forest visitors have a major concern for scenic quality.
>
> *Level 2*: Includes all areas seen from primary travel routes, use areas, and water bodies where at least one-fourth of the forest visitors have a major concern for scenic quality.
>
> *Level 3*: Includes all areas seen from secondary travel routes, use areas, and water bodies where less than one-fourth of the forest visitors have a major concern for scenic quality.

Silviculture

Forest management practices that deal with the establishment, development, reproduction, and care of forest trees.

Short-Term Road

Roads developed and operated for a limited time period but which are likely to be extended during a future entry and which cease to exist as a transportation facility after the purpose for which they were constructed is completed. These roads are considered part of the Forest transportation network.

Site Index

A measure of the relative productive capacity of an area for growing wood. Measurement of site index is based on soil characteristics (depth and drainage of soil and parent material).

Slash

Debris left over after a logging operation, i.e., limbs, bark, and broken pieces of logs.

State Historic Preservation Officer (SHPO)

State-appointed official who administers Federal and State programs for cultural resources.

Subsistence Use

The customary and traditional uses by rural Alaskan 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 by-products of fish and wildlife resources taken for personal or family consumption; for barter or sharing, for personal or family consumption; and for customary trade.

Successional Stage

One stage in a series of changes affecting the development of a biotic community. On its path to a climax stage the community will pass through several stages of adaptation to environmental changes.

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.

Thousand Board Foot Measure

A method of timber measurement in which the unit is equivalent to 1,000 square feet of lumber one inch thick. It can be abbreviated Mbd, Mbm, or MBF.

Timber Appraisal

Establishing the fair market value of timber by taking the selling value minus manufacturing costs, the cost of getting logs from the stump to the manufacturer, and an allowance for profit and risk.

Timber Entry

A term used to refer to how far into the timber rotation an area is on the basis of acreage harvested. For example, if an area is being managed for 3 entries over a 100-year rotation, the first entry would be completed when one-third (approximately 33 percent) of the available acreage is harvested (usually in 30-40 years); the second entry would be completed when two-thirds (approximately 66 percent) of the available acreage is harvested (usually 60-70 years); the third entry would be completed when all of the available acreage is harvested (at the end of the rotation).

Timber Sale Contract

Refers to the APC Long-Term Timber Sale Contract. The Timber Sale Contract is between the Alaska Pulp Corporation and the Forest Service, and is informally referred to by many as the 50-year Contract.

Tongass Land Management Plan (TLMP)

The 10-year land allocation plan for the Tongass National Forest that directs and coordinates planning and the daily uses and activities carried out within the forest. TLMP was completed in 1979 and was amended in 1986 and 1991. TLMP is currently undergoing revision; a supplement to the Revision Draft Environmental Impact Statement was issued in 1991. Until the Revision is completed, the TLMP as amended remains in effect.

Tongass Resource Use Cooperative Survey (TRUCS)

A compilation of data on subsistence uses for evaluating the effects of the Forest Service's action contemplated in the revision of the regional Tongass Land Management Plan.

Tongass Timber Reform Act (TTRA)

A law passed in November 1990 requiring changes in both the current Tongass Land Management Plan and in the revision of that plan. These changes include the following:

- A no-harvest zone or buffer of at least 100 feet on either side of all Class I streams and of all Class II streams which flow directly into Class I streams.
- Designation of five new Wilderness areas and expansion of a sixth.
- Designation of twelve other areas as permanent Land Use Designation II areas, to be managed in an essentially roadless condition with no commercial timber harvest allowed.
- All logging under the Long-term Contract is to be accomplished so that the percentage of volume class 6 and 7 timber (i.e., higher volume stands) currently existing within an area is not reduced.

Traffic Service Level

Describes a road's significant traffic characteristics and operating conditions. These levels are identified as a result of transportation planning activities. The range is A-D, with D reflecting the slowest speeds, least driver comfort, least convience, and lowest operating costs.

Turbidity

A measure of suspended sediments.

Understory

Any vegetation growing in a layer definitely below the main overstory canopy.

Uneven-Aged Management

The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Group and individual tree selection are examples of this type of management.

Utility Logs

Logs with less than 33 1/3 percent net sawlog volume (the volume that can be used for industrial wood products) but containing at least 50 percent firm usable pulp chips. See definition of Sawlog.

Value Comparison Unit (VCU)

These areas, which generally encompass a drainage basin, were established in the Tongass National Forest to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

Variety Class

Determines those landscapes which are most important and those which are of lesser value from a standpoint of scenic quality. The classification is based on the premise that all landscapes have some value, but those with the most variety or diversity have the greatest potential for high scenic value. There are three Variety Classes which identify the scenic quality of the natural landscape:

Class A: Distinctive - Refers to those areas where features of landform, vegetative patterns, water forms and rock formations are of unusual or outstanding visual quality.

Class B: Common - Refers to those areas where features contain variety in form, line, color, or texture or combinations thereof but which tend to be common throughout the character type and are not outstanding in visual quality.

Class C: Minimal - Refers to those areas with features having little change in form, line, color, or texture. Includes all areas not found under Classes A or B.

Visual Quality Objectives (VQOs)

The Forest Service Visual Management System uses three visual resource inventory components to develop Visual Quality Objectives (VQOs): variety class, visibility (distance zone), and visual sensitivity. Five VQO designations are used to define the acceptable level of change that a project may introduce into the landscape:

Preservation (P): This VQO allows for only "ecological" changes and applies to wilderness areas, primitive areas, other special classified areas, and some unique management units that do not justify other special classification.

Retention (R): Changes in the landscape must not be visually evident to the casual forest observer. Modifications must repeat form, line, color, and texture found in the characteristic and/or surrounding natural landscape.

Partial Retention (PR): Changes in the landscape may be visually evident, but must be integrated into and visually subordinate to the surrounding landscape. Activities may introduce form, line, color, and texture not common in the characteristic and/or surrounding landscape, but they should not attract attention.

Modification (M): Changes in the landscape may visually dominate the surrounding natural landscape; however, they must repeat the naturally established elements of form, line, color, and texture to appear compatible with the characteristic and/or surrounding natural landscape.

Maximum Modification (MM): Management activities may visually dominate the characteristic and/or surrounding natural landscape, yet when viewed in the background distance zone, activities must appear as natural occurrences within the landscape. Alternations in foreground and middleground views may be out of scale or introduce visual elements not found in the characteristic and/or natural landscape.

Volume

Stand timber volume based on standing net board feet per acre by Scribner Rule.

Volume Class

Volume class strata are used to describe the average volume of timber per acre in thousands of board feet (MBF). Following are the volume class strata and the range of volume each contains.

Volume Class Strata 3: Less than 8 MBF/acre (cleared land seedlings or pole timber stands).

Volume Class Strata 4: 8 to 20 MBF/acre.

Volume Class Strata 5: 20 to 30 MBF/acre.

Volume Class Strata 6: 30 to 50 MBF/acre.

Volume Class Strata 7: 50+ MBF/acre.

V-notch

A deeply incised stream channel which appears V-shaped in cross-section. Generally found on steep mountainous slopes.

Watershed

The drainage area of a stream.

Wetland

Those areas that are inundated by surface or groundwater frequently enough to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wilderness

An area established by the Federal Government and administered either by the Forest Service, National Park Service, Fish and Wildlife Service, or Bureau of Land Management in order to conserve its primeval character and influence for public enjoyment under primitive conditions in perpetuity.

Wildlife Analysis Area (WAA)

Alaska Department of Fish and Game administrative designation of an area that includes one or several Value Comparison Units (VCUs) for the purpose of regulating wildlife populations and reporting harvests.

Wildlife Habitat

The locality where a species may be found and where the essentials for its development and sustained existence are obtained.

Windthrow

Area where a tree is uprooted, blown down, or broken off by storm winds.

Chapter 9

Index

Index

A

B

C

D

E

F

G

H

I-J

K

L

M

N

O

P

R

S

T

V

W

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