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National
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R10-MB-570

January 2006

Kuiu Timber Sale Area

Draft Environmental Impact Statement

Abbreviations and Common Acronyms

ANILCA	Alaska National Interest Lands Conservation Act
ASQ	Allowable Sale Quantity
BMPs	Best Management Practices
CCF	Hundred Cubic Feet
CEQ	Council on Environmental Quality
DBH	Diameter at Breast Height
DEIS	Draft Environmental Impact Statement
EFH	Essential Fish Habitat
FEIS	Final Environmental Impact Statement
Forest Plan	Tongass Land and Resource Management Plan, 1997, as amended
GIS	Geographic Information System
HSI	Habitat Suitability Index
IDT	Interdisciplinary Team
LTF	Log Transfer Facility
LUD	Land Use Designation
MBF	Thousand Board Feet
MIS	Management Indicator Species
MMBF	Million Board Feet
MMI	Mass Movement Index
NEAT	NEPA Economic Analysis Tool
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NIC	Non-interchangeable Component
OGR	Old-growth Habitat Reserve
RMA	Riparian Management Area
RMO	Road Management Objective
ROS	Recreation Opportunity Spectrum
RVD	Recreation Visitor Day
SEIS	Supplemental Environmental Impact Statement
TTRA	Tongass Timber Reform Act
VCU	Value Comparison Unit
VQO	Visual Quality Objective
WAA	Wildlife Analysis Area

United States Department of Agriculture | Forest Service | Alaska Region Tongass National Forest | 648 Mission Street Ketchikan, AK 99901 Phone: (907) 225-3101 Fax: (907) 228-6215

File Code: 1950-3
Date: January 6, 2006

Dear Reader:

Here is your copy of the Draft Environmental Impact Statement (Draft EIS) for the Kuiu Timber Sale Area on the Petersburg Ranger District, Tongass National Forest. This document describes the no-action alternative and four action alternatives. At this point, Alternative 4 is the preferred alternative. However, please review all alternatives since any alternative, combination of alternatives, or a new alternative within the range of these alternatives may be selected in the final decision for this project.

I am the Responsible Official for this project and will make the decision on whether or not timber harvest will occur and where it will occur, the management of existing roads, and any other activities proposed in these alternatives.

Your comments are important and will help me make my decision. Comments that are substantive and specific to the Kuiu Timber Sale Area are the most valuable. It is important for those interested to respond to this Draft EIS within the comment period with comments and objections that can be meaningfully considered during the development of the Final Environmental Impact Statement (Final EIS). Comments or objections made at a later date or during the appeal period may not be considered, if no comments were made on the Draft EIS.

The 45-day comment period on the Draft EIS will begin on the date the Notice of Availability of the Draft EIS is published in the *Federal Register*. A public notice will also be placed in the *Juneau Empire*, the newspaper of record, and the *Petersburg Pilot,* the weekly newspaper in Petersburg, Alaska.

Please send written comments to Patricia Grantham, Petersburg District Ranger, or Kris Rutledge, Team Leader, Attn: Kuiu Timber Sale, USDA Forest Service, P.O. Box 1328, Petersburg, AK 99833. Comments may also be e-mailed to: comments-alaska-tongass-petersburg@fs.fed.us, with *Kuiu Timber Sale* in the subject line. If you need additional information or if you would like additional copies of this Draft EIS, please call the Petersburg Ranger District at (907) 772-3871.

Sincerely,

FORREST COLE
Forest Supervisor

Kuiu Timber Sale Area

Draft Environmental Impact Statement

Tongass National Forest
USDA Forest Service
Alaska Region

Lead Agency: USDA Forest Service
Tongass National Forest
648 Mission Street
Ketchikan, AK 99901

Responsible Official: Forrest Cole,
Forest Supervisor
Tongass National Forest

For Further Information Contact: Kris Rutledge, Planning Team Leader
Tongass National Forest
P.O. Box 1328
Petersburg, Alaska 99833
(907) 772-5905

Abstract: The Tongass National Forest proposes to harvest timber and build associated temporary roads in the Kuiu Timber Sale Area on Kuiu Island. This EIS examines one no-action alternative and four action alternatives with a range of harvest levels from approximately 14.6 to 42.6 million board feet (mmbf) of timber. Alternatives consider both clearcut harvest and partial harvest methods. One alternative includes some helicopter yarding. All alternatives include the choice of two log transfer facilities (LTF), one of which would require reconstruction. All action alternatives include reducing the number of miles of open road in the project area. Options for the location, size and habitat composition of three small old-growth habitat reserves are considered.

Summary

Introduction

The Forest Service has prepared this Environmental Impact Statement (EIS) to analyze the potential effects of timber harvest in the Kuiu Timber Sale Area in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations.

Project Area

The Kuiu Timber Sale Area is located on north Kuiu Island, on the Petersburg Ranger District, Tongass National Forest, Alaska Region (Region 10) of the USDA Forest Service, an agency of the U.S. Department of Agriculture (see Vicinity Map, Figure 1-1 in Chapter 1). The project area is approximately 46,102 acres in size.

Proposed Action

The Proposed Action for the Kuiu Timber Sale Area (Alternative 4) includes timber harvest and the development of a road management plan. The proposed timber harvest would result in the production of approximately 42.6 million board feet (mmbf) of timber from approximately 1,425 acres. This alternative includes a mix of ground based and helicopter yarding. Logs would be transported by truck to existing log transfer facilities at either Rowan Bay or Saginaw Bay.

Approximately 19 miles of new temporary roads would be necessary for timber harvest. No new classified roads designed for long-term use would be constructed. As part of the analysis for this Proposed Action, three small old-growth habitat reserves within or near the project area are analyzed to see if any adjustments to the location and configuration of the small OGRs should be made as a non-significant amendment to the Forest Plan.

Decisions to be Made

Based on the environmental analysis in this EIS, the Forest Supervisor will decide whether and how to implement activities within the Kuiu Timber Sale Area in accordance with Forest Plan goals, objectives, and desired future conditions. The decision may include:

- the location, amount, and method of timber harvest, temporary road construction, log transfer facilities, and silvicultural practices,
- access management measures including storage of classified roads,
- any necessary project-specific mitigation measures and monitoring requirements,
- a determination whether there may be a significant restriction on subsistence uses, and
- whether any changes in the small old-growth habitat reserves in Value Comparison Units (VCUs) 398, 399, or 402 should be made, and approved as a non-significant amendment to the Forest Plan.

Purpose and Need

The Kuiu Timber Sale is proposed at this time to respond to goals and objectives of the Tongass Land and Resource Management Plan, and to help move the project area toward desired conditions described in that plan. Applicable forest-wide goals and objectives include the following:

- Providing for a vigorous and healthy forest environment, including management of the timber resource for production of sawtimber and other wood products from suitable lands made available for timber harvest on an even-flow, long-term sustained yield basis, and in an economically efficient manner
- Ensuring the Forest Service acts in a responsible manner by: 1) providing a timber supply sufficient to meet the annual market demand for the Tongass National Forest, 2) meeting the demand for the planning cycle while maintaining a Forest-wide system of old-growth forest habitat to sustain old-growth associated species and resources, and 3) ensuring that the old-growth habitat reserve system meets the minimum size, spacing, and composition criteria
- Providing for current and future habitat needs of endemic wildlife species
- Maintaining and enhancing current riparian conditions
- Providing diverse opportunities for resource uses that contribute to the local and regional economies of Southeast Alaska, supporting a wide range of natural-resource employment opportunities within Southeast Alaska's communities

Public Involvement

The Kuiu Timber Sale project had extensive public involvement. The following is a summary of the public involvement for the Kuiu Timber Sale Area analysis:

- The Kuiu Timber Sale Area EIS was listed on the Schedule of Proposed Actions for project analysis since the Fall of 2004.
- Open houses with information about the Kuiu Timber Sale Area were held in Petersburg in March 2004, December 2004, and June 20, 2005, and in Kake in June 2004 and November 2004.
- Public scoping letters were mailed in February 2004.
- A Notice of Intent (NOI) to prepare an environmental impact statement was published in the *Federal Register* on August 9, 2004. A revised NOI was published on September 14, 2004.

Significant Issues

Significant issues for the Kuiu Timber Sale Area were identified through public and internal scoping. Measures of the significance of an issue are based on the extent of the geographic distribution or duration of the related effects, or the intensity of interest or resource conflict surrounding the issue.

Four issues were determined to be significant, and within the scope of the Kuiu Timber Sale project decision. These issues are addressed through the proposed action and the alternatives.

Issue 1 – Roadless Areas

This issue relates to timber harvest and the related construction of new roads to facilitate timber harvest in roadless areas or in the smaller unroaded areas (Figure 3-1 in Chapter 3). Additional roads and timber harvest could reduce roadless area acres within the project area, and could affect the roadless values as identified in the 2003 Tongass Land Management Plan Revision Final Supplemental Environmental Impact Statement – Roadless Area Evaluation for Wilderness Recommendations (Forest Plan SEIS).

Several public comments were received concerning management within roadless areas. This analysis examines the values of two roadless areas and three smaller unroaded areas that may be affected by this proposed project.

Issue 2 – Wildlife Habitat and Subsistence

This issue relates to cumulative effects on wildlife habitat and connectivity from past, present, and proposed activities, and the resulting effects on subsistence uses.

The Forest Plan conservation biology strategy includes a forest-wide network of large, medium, and small old-growth habitat reserves. How

these reserves are connected by old-growth habitat corridors is an important part of the strategy. The location and quality of the habitat corridors linking the reserves is important, as is the location and habitat of the small old-growth habitat reserves. Timber harvest and road construction could affect existing corridors connecting old-growth habitat.

Two options for the design of the small old-growth habitat reserves (small OGRs) in or near the Kuiu Timber Sale Area (VCUs 398, 399, and 402) were analyzed for each VCU. Option 1 is the Forest Plan design. Option 2 is an interagency design using old-growth habitat reserve criteria from Appendix K of the Forest Plan and several site-specific factors. See Chapter 2 and Issue 2: Wildlife Habitat and Subsistence (in Chapter 3) for a description of this analysis.

The cumulative reduction of high value winter range for Sitka black-tailed deer from past, present, and proposed timber harvest from this project may have adverse effects on the availability of deer for subsistence and may result in a significant possibility of a significant restriction to subsistence hunting and/or a reduction in prey species for wolves. Sitka black-tailed deer are also a Forest Plan Management Indicator Species (MIS) that represent the habitat needs of several old-growth associated wildlife species that require low elevation, high volume habitat (see Issue 2: Wildlife Habitat and Subsistence, in Chapter 3).

The black bear is an important game animal in Southeast Alaska. On Kuiu Island, black bear hunting is an important source of revenue. Bears may be negatively affected by loss of old-growth habitat, fragmentation, and increased road density.

Wolves experience higher mortality from hunting and trapping in Wildlife Analysis Areas (WAAs) with higher open road densities (Person et al. 1996).

Issue 3 – Timber Harvest Economics

This issue relates to the economic viability of the proposed timber sale or sales. It also relates to the potential local employment and revenue generated for communities in the local area. If proposed timber harvest alternatives are not designed to be economically viable across fluctuating market conditions, there is concern that the forest products industry in Southeast Alaska cannot remain viable.

Issue 4 – Cumulative Watershed Effects

Watersheds within the project area have high values for fisheries. In two of these watersheds, over 20 percent of the watershed area has been harvested within the past 30 years, and in another, approximately 19.8 percent of the watershed has been harvested. The cumulative effects of harvest and road building within the Kuiu Timber Sale Area may affect the condition of stream channels draining these watersheds.

Identification of cumulative watershed effects as a significant issue in this project necessitated detailed watershed analysis for all major watersheds within the project area. (See "Watershed Analysis for the Kuiu Landscape Assessment" in Appendix C of this EIS). The level of detail in each watershed analysis corresponds to the perceived level of cumulative risk associated with past, present and future projects.

Alternatives Considered in Detail

The No-Action Alternative (Alternative A), Proposed Action (Alternative 4), and three other action alternatives were considered in detail. Figures 2-1 through 2-5 in Chapter 2 display the five alternatives considered. Tables S-1 and S-2 compare the proposed activities and effects of the alternatives.

Alternative 1

This alternative proposes no timber harvest, road construction, changes to the road management objectives, or other activities within the Kuiu Timber Sale Area at this time. It represents the existing condition of the Kuiu Timber Sale Area. It does not preclude future timber harvest or other activities from this area.

Alternative 2

This alternative was developed to minimize impacts to wildlife and watersheds, and have no impact to roadless areas. The proposed timber harvest would result in the production of approximately 14.6 million board feet (mmbf) of timber from approximately 491 acres. Only ground-based logging systems would be used. The amount of trees remaining in a unit after harvest would vary from zero to fifty percent of the stand's pre-harvest basal area.

Where high wildlife values are identified, approximately 50 percent of the stand basal area would be retained to provide cover and structure for wildlife habitat. Harvested units in the Recreational River LUD would retain 50 percent of the stand basal area to retain scenic values. Logs would be transported to existing log transfer facilities (LTFs) in either Saginaw Bay or Rowan Bay. The Saginaw Bay LFT would require some reconstruction before use.

Approximately 2.9 miles of temporary road construction would be necessary for timber harvest. No new long-term use classified roads would be constructed. Temporary road construction would not cross any Class I or II fish streams in this alternative. The reconstruction of closed roads would require the installation of three crossing structures on Class I streams, and three crossing structures on Class II streams. Temporary road construction and closed road reconstruction would require placement of one crossing structure on a Class III stream, and five crossing structures on Class IV streams. These culverts or bridges would be removed upon completion of harvest activities.

After timber harvest is complete, 8.2 miles of currently open roads that would be used to access timber for this project would be closed to motorized traffic and placed in storage with stream crossing structures removed (Roads 6413, 46096, and 46021). Additionally, approximately 4.5 miles of roads currently in storage (Roads 6417, 46091, 46094, and 6443) would be opened and reconstructed to access timber. After harvest, these roads would be returned to storage condition with all stream crossing structures removed and closed to motorized traffic.

Alternative 3

This alternative was developed by modifying Alternatives 2 and 4 to reduce impacts to resources such as wildlife, hydrology, and fisheries while providing a larger economic return. The proposed timber harvest would result in the production of approximately 23.6 million board feet (mmbf) of timber from approximately 794 acres. Only ground-based logging systems would be used. The amount of trees remaining in a unit after harvest would vary from zero to fifty percent of the stand's pre-harvest basal area.

Where high wildlife values were identified, approximately 50 percent of the stand basal area would be retained to provide structure for wildlife habitat. Logs would be transported to existing log transfer facilities (LTFs) in either Saginaw Bay or Rowan Bay. The Saginaw Bay LTF would require some reconstruction before use.

Approximately 7.5 miles of temporary road construction would be necessary for timber harvest. No new classified roads would be constructed. One bridge would be placed across a Class II fish stream on a temporary road to reduce impacts to fish. The bridge would be removed after timber harvest activities are completed. The reconstruction of closed roads would require the installation of two crossing structures on Class I streams, and three crossing structures on Class II streams. Temporary road construction and closed road reconstruction would require placement of eight crossing structures on Class III streams, and 19 crossing structures on Class IV streams. All culverts or bridges would be removed upon completion of harvest activities.

After timber harvest is complete, 8.4 miles of currently open roads that would be used to access timber would be closed to motorized traffic and placed in storage with all stream crossing structures removed (Roads 6413, 46096, and 4618). Additionally, 3.2 miles of roads currently in storage that would be opened and reconstructed to access timber would be closed to motorized traffic and returned to storage condition with all stream crossing structures removed (Roads 6417, 46091, and 46094).

Alternative 4 (Proposed Action)

The Proposed Action for the Kuiu Timber Sale Area would result in the production of approximately 42.6 million board feet (mmbf) of timber from approximately 1,425 acres. A mix of ground-based and helicopter logging systems would be used. Helicopter logging would be used to access units on steeper ground. Using helicopters reduces the need for road construction and allows for selective harvest on steeper slopes.

The amount of trees remaining in a unit after harvest would vary from zero to fifty percent of the stand's pre-harvest basal area.

Where helicopter logging is necessary to access the standing timber, trees less than 16 inches diameter at breast height (DBH) and western hemlock greater than 36 inches DBH would be left standing to improve economics. Where high wildlife values were identified, approximately 50 percent of the stand basal area would be retained to provide cover and structure for wildlife habitat. Harvested units in the Recreational River Land Use Designation would retain 50 percent of the stand basal area. Logs would be transported to existing log transfer facilities in either Saginaw Bay or Rowan Bay. The Saginaw Bay LTF would require some reconstruction before use.

Approximately 19 miles of temporary road construction would be necessary for timber harvest. No new classified roads would be constructed. Temporary road construction would require the installation of two crossing structures across Class II fish streams. The reconstruction of closed roads would require the installation of three crossing structures on Class I streams, and three crossing structures on Class II streams. Temporary road construction and closed road reconstruction would require placement of 14 crossing structures on Class III streams, and 19 stream crossing structures on Class IV streams. All culverts or bridges would be removed upon completion of harvest activities.

After timber harvest is complete, 11 miles of currently open roads that would be used to access timber for this project would be closed to motorized traffic and placed in storage with all stream crossing structures removed (Roads 6413, 46096, 46021, 6418 and a portion of 6427). Additionally, 6.1 miles of roads currently in storage that would be opened and reconstructed to access timber would be closed to motorized traffic and returned to storage condition with all stream crossing structures removed (Roads 6417, 46091, 6422, 6443, and a portion of 6427).

Alternative 5

This alternative proposes only even-aged management with clearcut harvesting of timber to increase the economic return. The proposed timber harvest would result in the production of approximately 36.3 million board feet (mmbf) of timber from approximately 1,231 acres. Only ground-based logging systems would be used. Logs would be

transported to existing log transfer facilities in either Saginaw Bay or Rowan Bay. The Saginaw Bay LTF would require some reconstruction before use.

Approximately 17.1 miles of temporary road construction would be necessary for timber harvest. No new classified roads would be constructed. Temporary road construction would require the installation of two crossing structures across Class II fish streams. The reconstruction of closed roads would require the installation of three crossing structures on Class I streams, and three crossing structures on Class II streams. Temporary road construction and closed road reconstruction would require placement of 15 crossing structures on Class III streams, and 18 crossing structures on Class IV streams. All culverts or bridges would be removed upon completion of harvest activities.

After timber harvest is complete, 11 miles of currently open roads that would be used to access timber would be closed to motorized traffic and placed in storage with all stream crossing structures removed (Roads 6413, 46096, 46021, 6418, and a portion of 6427). Additionally, 6.9 miles of roads currently in storage that would be opened and reconstructed to access timber would be closed to motorized traffic and returned to storage condition with all stream crossing structures removed (Roads 6417, 46091, 46094, 6422, 6443, and a portion of 6427).

Design Criteria Common to All Action Alternatives/Project-specific Mitigation

Where effects to resources were unavoidable, design criteria and mitigation measures were developed to reduce those effects. All applicable Forest Plan standards and guidelines, Best Management Practices, laws, and Forest Service manual and handbook direction were incorporated into the design of the proposed units and alternatives. Design criteria and mitigation measures common to all action alternatives, and unit and/or alternative-specific mitigation measures are described in Chapter 2 and Appendix B.

Table S-1. Kuiu Timber Sale Area proposed activities by alternative

Proposed Activity		Alternative				
		1	2	3	4	5
Acres of Timber Harvested by Treatment						
Even-aged Management	Clearcut	0	197	409	1,026	1,231
Uneven-aged Management	Single tree selection - 50% basal area retention	0	87	72	215	0
	Group selection -50% basal area retention	0	19	19	42	0
Two-aged Management	Clearcut with reserves – 50% basal area retention	0	188	294	142	0
Total Acres		0	491	794	1,425	1,231
Acres of timber harvest by logging system						
Cable		0	408	759	1,108	1,082
Shovel		0	83	35	147	149
Helicopter		0	0	0	170	0
Miles of road maintenance/construction						
Maintenance: miles of open classified roads		0	48.0	47.8	45.2	45.2
Reconstruction: existing classified roads (closed after harvest)		0	4.5	3.2	6.1	6.9
Construction: temporary roads (closed after harvest)		0	2.9	7.5	19.0	17.1
Miles of road closure						
Classified roads currently drivable		0	8.2	8.4	11.0	11.0

Table S-2. Comparison of alternatives by issue and effects

Units of Measure	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Issue 1 – Roadless Areas					
Acres harvested within roadless areas	0	0	67	210	114
Miles of temporary roads constructed within roadless areas	0	0	0.2	0.95	0.95
Percent of affected area including zones of influence (600' for harvest, 1,200' for roads)	0	0	3%	7%	4%
Change in roadless characteristics?	No	No	No	No	No
Eligible for Wilderness designation?	Yes	Yes	Yes	Yes	Yes
Issue 2 – Wildlife Habitat and Subsistence					
Acres of productive old-growth maintained	27,112	26,628	26,329	25,710	25,906
Project area open road density (miles per square mile)	0.78	0.67	0.66	0.63	0.63
Acres of high value deer habitat remaining after harvest (HSI = 0.60 – 1.0)	6,824	6,696	6,694	6,513	6,578
Coarse canopy old-growth; percent change from historic level	51%	52%	52%	54%	53%
Acres high value wildlife POG below 800 feet that will be clearcut	0	96	90	341	446
Subsistence	Possible future restrictions based on the Forest Plan's predicted cumulative effects for subsistence hunting for deer.				

Table S-2 (continued). Comparison of alternatives by issue and effects

Units of Measure	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Issue 3 – Timber Harvest Economics					
Amount of volume (mbf)	0	14,572	23,585	42,649	36,291
Amount of volume (ccf)	0	29,738	48,134	87,039	74,063
Expected bid ($/mbf) to Rowan Bay LTF	0	$13.03	$8.51	$18.04	$20.59
Expected bid ($/mbf) to Saginaw Bay LTF	0	$3.18	$3.71	$16.21	$18.19
Total Logging Costs per mbf (including road costs) to Rowan Bay LTF	0	$229.00	$237.02	$219.47	$211.53
Total Logging Costs per mbf (including road costs) to Saginaw Bay LTF	0	$249.10	$246.84	$223.20	$216.43
Road costs per mbf (construction and reconstruction) to Rowan Bay LTF	0	$21.85	$31.20	$27.71	$32.55
Road costs per mbf (construction and reconstruction) to Saginaw Bay LTF	0	$31.29	$37.04	$30.93	$36.35
Issue 4 – Cumulative Watershed Effects					
Acres of extreme mass movement index (MMI 4) soils in units	0	13.7	8.3	51.8	15.9
Cumulative timber harvest acres - % of Dean Creek Watershed[a]	31.3	31.3	31.3	34.0	34.0
Cumulative timber harvest acres - % of Saginaw Creek Watershed[a]	8.2	9.3	12.3	13.5	12.3
Cumulative timber harvest acres - % of WS #109-45-10090 [a]	19.8	20.9	19.8	23.1	23.1
Cumulative timber harvest acres - % of WS #109-44-10370[a]	8.2	11.0	10.7	11.4	10.9
Cumulative timber harvest acres - % of Security Creek Watershed[a]	23.9	24.7	25.7	27.2	27.2
Cumulative timber harvest acres - % of Rowan Creek Watershed[a]	10.6	11.1	11.2	12.2	12.4
Cumulative timber harvest acres - % of Kadake Creek Watershed[a]	17.7	18.1	18.2	18.7	18.4

[a] Percent of area harvested in past 30 years

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Kuiu Timber Sale Area

Draft Environmental Impact Statement

Chapter 1
Purpose and Need

Chapter 1
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Chapter 1
Purpose and Need

1.1 Introduction

The Kuiu Timber Sale Area is located on north Kuiu Island, on the Petersburg Ranger District, Tongass National Forest, Alaska Region (Region 10) of the Forest Service, an agency of the U.S. Department of Agriculture (see Vicinity Map, Figure 1-1).

This is a Draft Environmental Impact Statement (EIS). A Final EIS will be published at a later date. The Final EIS may have changes based on public comment on this Draft EIS.

This chapter discusses the background of the Kuiu Timber Sale project and tiers to the Tongass National Forest Land and Resource Management Plan (referred to as the Forest Plan in this document). It includes the steps taken to identify environmental issues and public concerns related to implementation of the project.

1.2 Proposed Action

A "proposed action" is defined early in the project-level planning process to briefly describe the project's actions and magnitude. This serves as a starting point for the environmental analysis and gives the public and other agencies specific information on which to focus comments. Using these comments (see discussion of Significant Issues later in this chapter), and information from preliminary analysis, the interdisciplinary team develops alternatives to the proposed action. These are discussed in detail in Chapter 2.

The Proposed Action for the Kuiu Timber Sale Area (Alternative 4) is for the sale and harvest of approximately 42.6 million board feet (mmbf) of sawlog and utility volume from 1,425 acres of National Forest System land. This harvest would require about 19 miles of temporary road construction, and 6.1 miles of road reconstruction. The logs would be hauled by truck to existing log transfer facilities (LTFs) at Rowan Bay or Saginaw Bay for shipment. Timber from this project would be offered through the Tongass National Forest timber sale program beginning in 2006. The timber may be offered as a single sale or as multiple sales of varying sizes.

The Proposed Action includes adjusting the boundary of three small old-growth habitat reserves (OGRs) in or adjacent to the project area to meet or slightly exceed Forest Plan minimum requirements. The proposed adjustments would result in changes to the size of the OGRs (see Chapter 3, "Issue 2 Wildlife Habitat and Subsistence Use" for a detailed description of proposed OGR adjustments). Any proposed reserve adjustments would require a non-significant amendment to the Forest Plan.

The Kuiu Timber Sale project proposes timber harvest on selected lands suitable for the production of sawtimber and other wood products. This harvest would help meet market demands for timber and provide resource production opportunities and employment for local communities. These proposals are in compliance with the goals and objectives of the Forest Plan. Harvest methods other than traditional clearcutting are proposed where feasible, based on site conditions. Harvest is expected to improve timber growth and contribute toward a balance of age classes.

1.3 Purpose and Need

The purpose of the project is to harvest timber from up to 1,425 acres and construct up to 19 miles of temporary roads (no classified roads would be constructed) to access the proposed timber harvest units. Harvesting timber now would produce sawlogs and utility volumes and generate an immediate economic return.

The secondary purpose of the project is to develop a road management plan for the Kuiu Timber Sale Area which would facilitate transportation planning for short-term and long-term access across the project area. There is a need to manage an efficient transportation system through reconstruction, storage, and maintenance of roads and landings.

There are approximately 76 miles of existing classified roads within the project area. About 56 miles of these roads are currently open for public use. These roads are used for timber harvest and connect to existing log transfer facilities located at Rowan Bay and Saginaw Bay. The roads do not connect to any existing community.

The Kuiu Timber Sale project would achieve goals and objectives described in the Forest Plan, and help move the project area toward desired future conditions described in that plan. Forest-wide goals and objectives (Forest Plan, pp. 2-3 and 2-4) that this proposed action would achieve include the following:

- Providing for a vigorous and healthy forest environment, including management of the timber resource for production of sawtimber

and other wood products from suitable lands made available for timber harvest on an even-flow, long-term sustained yield basis, and in an economically efficient manner

- Ensuring the Forest Service acts in a responsible manner by: 1) providing a timber supply sufficient to meet the annual market demand for the Tongass National Forest, 2) meeting the demand for the planning cycle while maintaining a Forest-wide system of old-growth forest habitat to sustain old-growth associated species and resources, and 3) ensuring that the old-growth habitat reserve system meets the minimum size, spacing, and composition criteria
- Providing for current and future habitat needs of endemic wildlife species
- Maintaining and enhancing current riparian conditions
- Providing for a diversity of opportunities for resource uses that contribute to the local and regional economies of Southeast Alaska, supporting a wide range of natural-resource employment opportunities within Southeast Alaska's communities

Appendix A of this document provides information on how this project relates to the overall Tongass timber sale program, and why the project is being scheduled at this time.

1.4 Decisions to be Made

Based on the environmental analysis in this Draft EIS, the Forest Supervisor would decide whether and how to implement activities within the Kuiu Timber Sale Project Area in accordance with Forest Plan goals, objectives, and desired future conditions. The decision may include:

- the location, design, scheduling, amount, and method of timber harvest, temporary road construction, log-transfer facilities, and silvicultural practices,
- access management measures including storage of classified roads,
- any necessary project-specific mitigation measures and monitoring requirements,
- a determination whether there may be a significant restriction on subsistence uses, and
- whether any changes in the small old-growth habitat reserves in VCU 398, 399, or 402 should be made and approved as a non-significant amendment to the Forest Plan.

Legend

- Non-National Forest
- Lakes/Salt Water
- 500ft Contour Interval
- Kuiu Project Area Boundary
- Existing Roads

Figure 1-1

Vicinity Map of Kuiu Timber Sale
Petersburg Ranger District
Tongass National Forest

Miles
0 2.5 5

1.5 Management Direction

The Kuiu Timber Sale EIS is a project-level analysis. The scope of the analysis is confined to the Kuiu Timber Sale Area, addressing the significant issues and environmental consequences of the proposed action and its alternatives. While it does not attempt to address decisions made at higher levels of planning, it does implement direction provided at those higher levels.

The Forest Plan embodies the provisions of the National Forest Management Act (NFMA), its implementing regulations, and other guiding documents. The Forest Plan sets forth in detail the direction for managing the land and resources of the Tongass National Forest. Where appropriate, this EIS tiers to the Forest Plan.

In Sierra Club v. Lyons (J00-0009 CV (JKS)), The U.S. District Court, District of Alaska directed the Forest Service to prepare a supplemental environmental impact statement that evaluated and considered roadless areas within the Tongass for recommendations as potential wilderness areas. In February 2003, The Tongass National Forest completed the Supplemental Environmental Impact Statement to the Forest Plan (referred to as the Forest Plan SEIS in this document). The No-Action alternative was selected, continuing management under the 1997 Forest Plan with no new wilderness recommendations. The Forest Plan SEIS provides updated inventory information to which this project tiers.

1.5.1 Forest Plan Land Use Designations

The Forest Plan uses land use designations (LUDs) to guide the management of the National Forest System lands on the Tongass National Forest. Chapter 3 of the Forest Plan contains a detailed description of each land use designation. The Kuiu Timber Sale Area includes three of these land use designations – Timber Production, Recreational River, and Old-growth Habitat Reserve (Table 1-1). Goals, objectives and desired future conditions of each are summarized below. The locations of each land use designation on Kuiu Island, including the Kuiu Timber Sale Area, are shown on Figure 1-2. Less than one percent of the lands in the project area are non-National Forest System Lands.

The area contains no known features of special interest other than two bands of karst[1]. The mapped karst resources encompass approximately 6,624 acres or 16 percent of the project area. The area does not include

[1] Karst – A type of topography that develops in areas underlain by soluble rocks, primarily limestone. Dissolution of the subsurface strata results in areas of well-developed surface drainage resulting in sinkholes, collapsed channels, or caves.

any Potential Research Natural Areas and has not been identified for any other scientific purpose.

1.5.1.1 Timber Production LUD (42,905 acres)

These lands are managed for the production of saw timber and other wood products on an even-flow, long-term sustained yield basis. The forested areas are healthy stands with a balanced mix of age classes. An extensive road system is developed for accessing timber as well as recreation, hunting, fishing, and other public and administrative uses. Roads may be closed, either seasonally or year-round, to address resource and other needs. Management activities will generally dominate most seen areas. A variety of wildlife habitats, predominately in the early and middle successional stages are present.

Within the Timber Production LUD are areas of beach and estuary fringe, riparian reserves, high-vulnerability karst, Riparian Management Areas (RMAs), non-forested areas, and non-productive forested areas that total approximately 8,182 acres. These acres are considered unsuitable for timber production and were removed from the suitable[1] timber base by the Forest Plan. Before the signing of the Forest Plan Record of Decision, approximately 1,739 acres of what is now unsuitable land had been harvested. Most of this harvest took place in what are now recognized as riparian areas, beach fringe areas, and non-development LUDs. These acres are included in the total acres harvested discussion in the "Prior Management of the Area" section in this chapter and throughout the EIS.

Approximately 29,302 acres in the Timber Production LUD are considered suitable for timber production of which 8,654 acres have been previously harvested. Of the total acres harvested in the project area (approximately 1,739 from unsuitable lands and 8,654 from suitable lands) 4,766 acres have been pre-commercially thinned. The remaining 5,627 are too young and not large enough for commercial thinning. The second growth that is on suitable land, is not proposed for harvest at this time.

[1] Suitable Forest land - Forest land that is producing or is capable of producing crops of industrial wood and; 1) has not been withdrawn by Congress, the Secretary of Agriculture, or the Chief of the Forest Service; 2) existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity or watershed conditions; 3) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that it is possible to restock adequately within five years after final harvest, 4) adequate information is available to project responses to timber management activities, and 5) where timber harvest is allowed under the Forest Plan.

The remaining 20,708 acres of suitable timber in the project area includes land with productive old-growth[1] timber and is available for harvest at this time.

1.5.1.2 Recreational River LUD (1,246 acres)

Recreational River segments are managed to maintain a free-flowing river resource, while providing for access and use consistent with the Wild and Scenic Rivers Act and the Alaska National Interest Lands Conservation Act (ANILCA). Timber harvest is permitted on suitable lands if adjacent lands are being managed for timber. These lands would also be managed for recreation use and activities to meet the criteria for number of social encounters, on-site developments, methods of access and visitor impacts. Roads are permitted to access, parallel or cross the river. Visual Quality Objectives would be applied with the corridor.

In the Kuiu Timber Sale Area, approximately 1,246 acres are in the Recreational River LUD. This LUD was established to maintain the eligibility status of the Kadake River corridor for Wild and Scenic River designation.

1.5.1.3 Old-growth Habitat LUD (1,595 acres)

In this LUD, the objectives are to provide forest habitats to maintain viable populations of native and desired non-native fish and wildlife species that may be closely associated with old-growth forests. Other objectives are to contribute to the habitat capability of fish and wildlife resources in order to support sustainable human subsistence, and to maintain biological diversity components and ecological processes associated with old-growth forests.

In the Kuiu Timber Sale Area, there are approximately 1,595 acres in the Old-growth Habitat LUD.

[1] Productive Old-growth – old-growth stands capable of producing 20 cubic feet per acre per year with 8,000 or more board feet of timber per acres

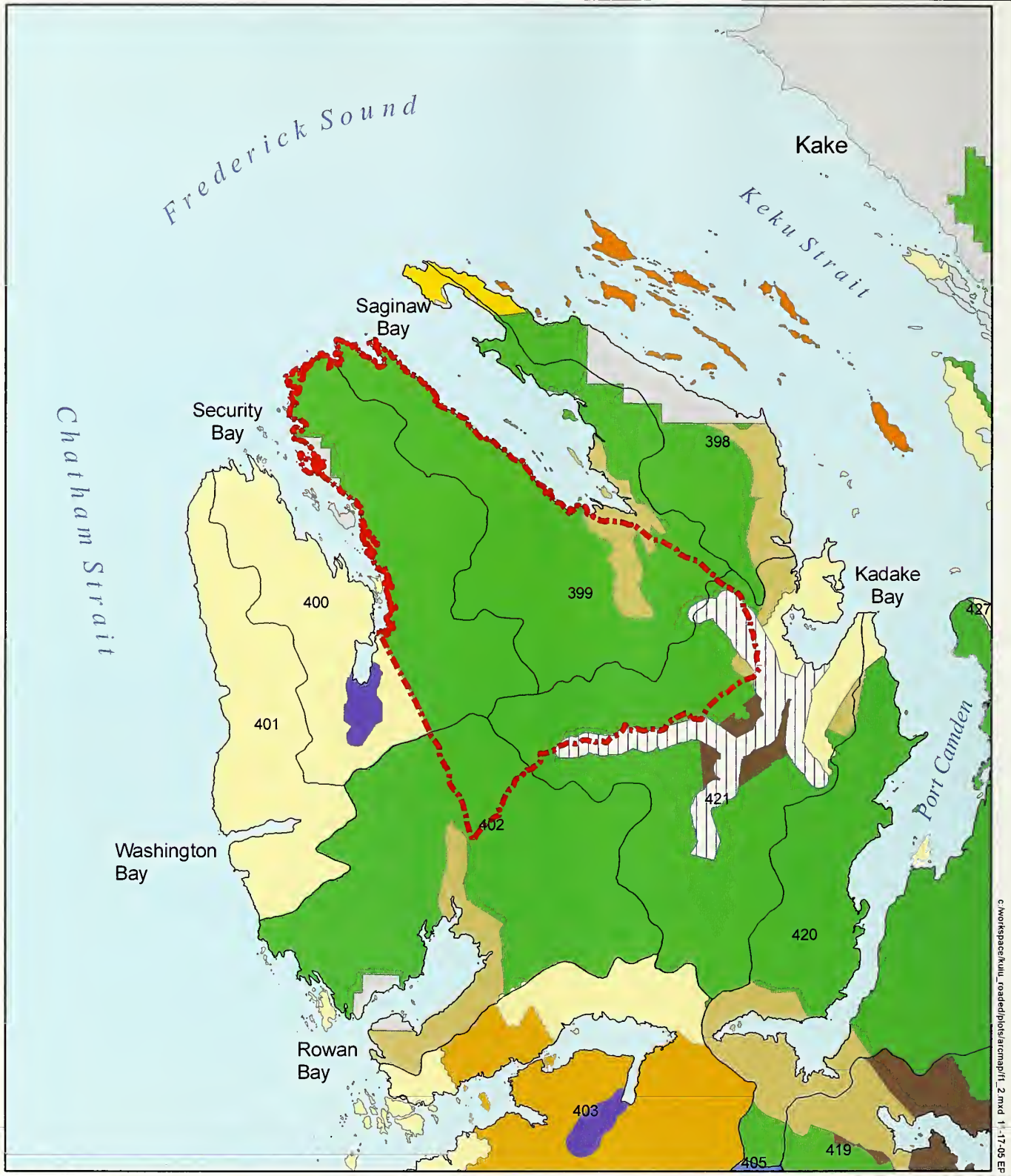

Figure 1-2

Land Use Designation Map of Kuiu Timber Sale
Petersburg Ranger District
Tongass National Forest

Table 1- 1. Forest Plan land use designations on Kuiu Island

Land Use Designation	Kuiu Island	Kuiu Timber Sale Area	% of project area in LUD
Non-development LUDs			
Wilderness	124,576 acres	0	0
Special Interest Area	1,094 acres	0	0
Remote Recreation	42,347 acres	0	0
Old-growth Habitat	25,171 acres	1,595 acres	3%
Semi-remote Recreation	106,149 acres	0	0
Wild River	1,807 acres	0	0
Recreational River	6,585 acres	1,246 acres	3%
Development LUDs			
Modified Landscape	29,444 acres	0	0
Timber Production	141,241 acres	42,905 acres	93%
Non-National Forest System Land	3,787 acres	356 acres	<1%

1.5.2 Non-National Forest System Lands

There are 356 acres of non-National Forest System lands within the project area: two acres of private land, seven acres of Bureau of Land Management land, and 347 acres of State of Alaska land. These lands are not designated in the Forest Plan; however, for purposes of this EIS they are considered in the action alternatives of this project when analyzing cumulative effects.

1.6 Description of the Project Area

1.6.1 Geographic Location and Boundaries

The Kuiu Timber Sale Area is located on north Kuiu Island, on the Petersburg Ranger District of the Tongass National Forest in Southeast Alaska, Townships 57, 58, and 59 South, Ranges 71 and 72 East, Copper River Meridian. The project area includes lands within Value Comparison Units (VCUs) 399, 400, 402, and 421, an area of approximately 46,102 acres (Figure 1-2). VCUs are comparable to large watersheds and generally follow major topographic divides (see the Introduction to Chapter 3 for a more detailed definition of VCUs). The project area is encompassed by Forest Service Roads 6402 and 6415 and the peninsula between Security Bay and Saginaw Bay. There are seven watersheds within the project area: Dean Creek, 109-45-10090, Saginaw, Security, 10-44-10370, and parts of Kadake Creek and Rowan Creek (see Figure 3-7 in Chapter 3).

The Kuiu Timber Sale Area is within the Rowan Sediments and North Prince of Wales-Kuiu Carbonates ecological subsections (Nowacki et al. 2001). Specifically, the project area is located in the north central portion of Kuiu Island.

The western portion of the project area is in the Rowan Sediments area, which has long, smooth, forested hillslopes dissected by broad U-shaped glacial valleys. The eastern portion of the project area is in the North Prince of Wales-Kuiu Carbonates area, which has surfaces that undulate irregularly, and possess unique topographic oddities including vertical shafts and cliffs (Nowacki et al. 2001).

The project area is located approximately 12 air-miles southwest of the city of Kake. Approximately 356 acres of non-National Forest System lands are included in the project area. Access to the area is by boat or floatplane. The National Forest System lands are divided into three land use designations (LUDs), with 42,905 acres in the Timber Production LUD where development is permitted.

1.6.2 Prior Management of the Area

Timber harvest and associated road building in the Kuiu Timber Sale Area occurred mostly during the 1970s and 1980s under a long-term contract (Table 1-2). Some timber was also harvested in small sales in the early 2000s from the Crane and Rowan Mountain Timber Sale. All of the harvest units (approximately 10,393 acres) have successfully regenerated and approximately 4,766 of these acres have been pre-commercially thinned. The remaining 5,627 acres are not eligible for thinning at this time. Log hauling in this area used Rowan Bay and Saginaw Bay Log Transfer Facilities (LTFs).

Table 1- 2. Past activities by decade in the Kuiu Timber Sale Area

Decade	Activity
1900-1959	Minimal activity
1960-1969	1,277 acres timber harvest
1970-1979	5,205 acres timber harvest
1980-1989	2,605 acres timber harvest Dean Creek fish pass built and Coho fry transplanted
1990-1999	938 acres timber harvest Dean Creek fish pass modified for pink salmon passage
2000-2005	368 acres timber harvest

1.6.3 Project Implementation

If the decision is made to harvest timber in the Kuiu Timber Sale Area, the timber may be offered for harvest in one sale or multiple sales of various sizes in the near future. The number and volume of the timber sales would depend on the final decision and the timber demand, which is reviewed on an annual basis. More information on scheduling timber harvest can be found in Appendix A of this EIS.

Environmental analysis includes activities that may occur "in the reasonably foreseeable future," either within or adjacent to the Kuiu Timber Sale Area. The timeframe is generally considered to be ten years or less. The following items have been or are currently listed as possible projects.

1.6.4 Future Projects

1.6.4.1 Tongass Timber Sale Schedule

The Tongass Timber Sale Schedule lists all proposed timber sales and the timber volumes therein, the methods of harvest, and the associated road activities for the upcoming five-fiscal-year period. Included in the list is information for all sales where site-specific analysis, in accordance with procedures under the National Environmental Policy Act, has been completed (sales scheduled at least 1-3 years in the future) as well as more general information for the sales proposed in the final 2 years of the 5-fiscal-year period in which site-specific analysis has yet to be completed.

The most recent sale schedule does not list any planned sales within VCUs 399 or 400. Portions of VCU 402 and 421 overlap the Bayport planning area. Planning for Bayport is scheduled to begin in 2010 with up to 35 mmbf offered in one or more sales.

The Crane and Rowan Mountain Timber Sales Record of Decision was signed in July 1998. The area encompasses VCUs 398, 399, 400, 402,

421, and a portion of 420. Approximately 20.1 mmbf of the Crane Timber Sale were harvested. The Rowan Mountain Sale (20.2 mmbf) and Road 6402 sale (9.5 mmbf) were mutually cancelled in 2004. Approximately 16.5 mmbf of timber from 816 acres in 20 units, with approximately 5 miles of road construction may be reoffered in other sales. Six of these units are within the Kuiu Timber Sale Area and are proposed in the following VCUs.

- In VCU 400, there are five units totaling 389 acres of two-aged management with partial harvest. Trees less than 16 inches DBH and over 36 DBH would be left within the units. The logging system used would be helicopter harvest.
- In VCU 399, there is one unit of 64 acres. Fifty acres would be clearcut harvested (even-aged management) and 14 acres would be partially harvested (two-aged management).

The Threemile Record of Decision (19.5 mmbf) was signed in April of 2004 and is currently in litigation. This sale is in VCU 419 on Kuiu Island and is not adjacent to the Kuiu Timber Sale Area.

1.6.4.2 Kuiu Island Landscape Assessment

The Kuiu Island Landscape Assessment (2005) and public comments identified several projects that could be implemented within or near the project area. These projects are displayed in Table 1-3.

Table 1- 3. Potential future management opportunities in the Kuiu Timber Sale Area

Watershed	Activity	Benefiting Resource
Saginaw Creek	Place 6.2 miles of classified road in storage	Hydrology and wildlife
	Evaluate approximately 450 acres of riparian areas for thinning	Hydrology and wildlife
	Evaluate approximately 1,025 acres of upland second growth stands for pruning or thinning	Wildlife and timber
	Evaluate large wood installation	Fisheries enhancement
Security Creek	Evaluate 78 acres of harvested riparian areas for thinning opportunities	Hydrology and wildlife
	Evaluate large wood installation in Security Creek	Fisheries enhancement
#109-45-10090	Place 1.4 miles of road in storage	Hydrology and wildlife
Dean Creek	Place 1.2 miles of road in storage	Hydrology and wildlife
	Evaluate large wood installation in Dean Creek	Fisheries enhancement
Kadake Creek	Evaluate 410 acres of harvested riparian areas for thinning opportunities	Wildlife
General	Evaluate 44 red[a] culverts as opportunities arise	Fisheries – enhance juvenile fish passage
	Decommission[b] any temporary roads that are currently open and no longer needed	Hydrology and wildlife
	Replace/remove aging log bridges and culverts	Safety and hydrology
	Identify all closed roads and Maintenance Level 1[c] roads that are being used by wheeled traffic. Place in storage or reopen with proper drainage structures installed.	Safety, hydrology, and wildlife

[a] Red culvert – a culvert that cannot pass juvenile fish during flows equal to or less than the discharge predicted to occur two days before or after the mean annual flood levels.
[b] Decommission – activities that result in the stabilization and restoration of unneeded roads to a more natural state.
[c] Maintenance Level 1 – closed, basic drainage maintenance (see the Road Maintenance Objectives in Appendix B)

1.7 Public Involvement

Public involvement is a key component of the planning process. The Council on Environmental Quality (CEQ) defines scoping as "...an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7). Among other things, the scoping process is used to invite public participation, to help identify public issues, and to obtain public comment at various stages of the environmental analysis process. Scoping begins early and is a process that continues until a decision is made. Comments received at other levels of the planning process, such as for the Forest Plan and the landscape level analysis, were also considered. The following paragraphs describe the public involvement activities that have occurred for the Kuiu Timber Sale Analysis.

The Kuiu Timber Sale project has been included in the Tongass National Forest Timber Sale Plan since 2004 and was first placed on the spring 2004 Schedule of Proposed Actions (SOPA). This schedule is updated quarterly and mailed to everyone who requests it, and is available at Ranger District offices and on the Tongass National Forest website (*www.fs.fed.us/r10/tongass*).

1.7.1 Kuiu Island Landscape Assessment

In general, the vision for Kuiu Island, as expressed in public comments received from scoping and open houses, parallels the Forest Plan's desired condition for the Tongass. People want to see a healthy deer population maintained on the island in perpetuity to meet the needs of subsistence hunters. They are concerned about the fragmentation of old-growth habitat and supportive of the old-growth habitat conservation strategy.

Public comments support a sustainable timber harvest, although opinions differ on what level of harvest is acceptable. Public comments concerning recreation emphasize maintaining a wide spectrum of recreation opportunities, from developed to non-developed. Public comment strongly favors protection of water quality as it relates to fish and shellfish habitat because of the importance of aquatic species for subsistence and commercial uses. Public opinions regarding National Forest System roads vary widely, but most people agree that all open roads should be well maintained to minimize their environmental effects and to provide for the comfort and safety of users.

Nearby residents in Kake, Point Baker, and Port Protection emphasize the importance of considering traditional community values and

customs when proposing management activities. They express a desire for balance between meeting the economic needs of a community and meeting the ecological needs of a landscape.

1.7.2 Scoping

1.7.2.1 Public Mailing

Public scoping was conducted in February 2004. A newsletter identifying the project area and requesting information on site-specific concerns was mailed to approximately 270 people who requested to be on project mailing lists, who previously expressed interest in timber sale proposals, or who either own property or conduct business near the project area. In addition, the newsletter was mailed to local, state, and federal agencies and federally-recognized tribal governments.

The project mailing list is frequently updated to accommodate requests for additions or deletions, and to update mailing addresses.

The Forest Service received 28 responses to this mailing. While some comments support the proposed timber sale, most express concerns about additional road construction, uneconomic timber harvest, disturbance to wildlife, clearcutting as a harvest method, and the cumulative effects of additional harvest on previously harvested watersheds.

1.7.2.2 Open Houses

Open houses that included information about the Kuiu Timber Sale were held in Petersburg in March 2004, December 2004, and June 2005. Open houses were held in Kake in June and November of 2004. Open houses were advertised in the *Petersburg Pilot*, the local weekly newspaper in Petersburg, and on KFSK Public Radio in Petersburg. Flyers were posted on bulletin boards throughout Petersburg. In Kake, flyers were sent to the City Council for posting prior to the meetings. There is no local paper or radio station in Kake.

1.7.3 Notice of Intent

A Notice of Intent to Prepare an Environmental Impact Statement was published in the *Federal Register* on August 9, 2004. On September 14, 2004 a revised Notice of Intent was published. This Notice briefly described the proposed action and the purpose and need for the project. Estimated timelines for the project were given, along with project background summary and contact information for those interested in participating in the planning process.

1.7.4 Consultation with Other Government Agencies

The Forest Service is committed to working closely with other agencies at all stages of planning. The agency is responsible for coordinating reviews of the project by several other agencies. In some cases, the reviews are required because another agency has authority to issue permits for certain proposed activities. In other cases, the reviews allow interaction with other agencies with responsibilities for certain environmental conditions, like clean water or healthy wildlife

populations. This interagency cooperation helps identify the means to avoid or mitigate possible harmful environmental effects. In many cases, an ongoing professional dialogue is maintained with these agencies throughout the planning process.

The following agencies have been consulted about this project:

- Alaska Department of Fish and Game
- Alaska Department of Environmental Conservation
- Alaska Office of History and Archaeology
- Alaska Department of Natural Resources
- U.S. Environmental Protection Agency
- National Marine Fisheries Service
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service

In 1998, in a collaborative process, a Forest Service Wildlife Biologist worked with biologists from the U.S. Fish and Wildlife Service (USFWS), the Alaska Department of Fish and Game (ADF&G), and the Alaska Department of Environmental Conservation (DEC) to develop a biologists' recommended design for placement of the small old-growth habitat reserves for all of Kuiu Island. In June 2004, representatives from ADF&G, USFWS, and DEC met with the Kuiu Interdisciplinary Team (IDT) to further discuss options for reconfiguring the small old-growth habitat reserves in northern Kuiu Island, including those in or near the project area. The following day, the IDT coordinated an interagency field trip to the project area with representatives of ADF&G, USFWS, and DEC. There was agreement to submit the proposed small OGR recommendations for VCUs 398, 399, and 402 for analysis in this document.

1.7.5 Consultation with Federally Recognized Tribal Governments

Consultation with federally recognized tribal governments included government-to-government and staff level communications. The Forest Service met with representatives of the Organized Village of Kake, and sent letters of consultation to the Petersburg Indian Association, SeaAlaska Corporation, and Tlingit/Haida Central Council.

1.7.6 Availability of Draft EIS

The Notice of Availability of this Draft EIS will be published in the *Federal Register*, in the *Juneau Empire*, the official newspaper of record, and in the *Petersburg Pilot*. The 45-day public comment period will begin on the date of publication of the Notice of Availability in the *Federal Register*. This Draft EIS will be mailed to everyone on the project mailing list. A list of recipients is included in Chapter 4. The Draft EIS will also be available at the Petersburg Ranger District and in public libraries throughout Southeast Alaska.

1.8 Significant Issues

Significant issues are used to formulate and design alternatives, prescribe mitigation measures, and analyze significant effects. Significant issues for the Kuiu Timber Sale have been identified through public and internal scoping. Similar issues are combined where appropriate. Issues can arise from a variety of sources, including:

- issues, concerns, and opportunities identified in the Forest Plan,
- issues identified for similar projects (past actions),
- current internal issues,
- changes in public uses, attitudes, values, or perceptions,
- issues raised by the public during scoping, and
- comments from other government agencies.

Measures of the significance of an issue are based on the extent of the geographic distribution, the duration of the related effects, or the intensity of interest or resource conflict surrounding the issue. For an issue to be considered significant at the project level, it must be relevant to the specific project so that it can be appropriately addressed at the project level. Some issues have already been resolved through national level direction or analyzed at the Forest Plan level.

Once a significant issue is identified, measures are developed to analyze how each alternative responds to the issue. Measures are chosen that are quantitative (where possible), predictable, responsive to the issue, and linked to cause and effect relationships. These measures describe how the alternative affects the resource or resources at the heart of the issue. Monitoring and mitigation of the anticipated environmental effects of the project are also designed to be responsive to significant issues.

Four issues were determined to be significant within the scope of the Kuiu Timber Sale decision. These issues are addressed through the proposed action and the alternatives.

Some concerns will be addressed in the same way in all alternatives. For example, riparian and beach buffer strips would protect fish habitat from some of the effects of timber harvest in all alternatives. These measures are described in Chapter 2 in the section titled, "Design Criteria Common to All Action Alternatives." They are also discussed in Chapter 3, "Other Environmental Considerations."

1.8.1 Issue 1 – Roadless Areas

This issue relates to timber harvest and the related construction of new roads to facilitate timber harvest in roadless areas or in the smaller unroaded areas (Figure 3-1). Additional roads and harvest could result in reducing acres of roadless areas in the project area, and could affect roadless values as identified in the 2003 *Tongass Land Management Plan Revision Final Supplemental Environmental Impact Statement – Roadless Area Evaluation for Wilderness Recommendations* (Forest Plan SEIS).

Roadless areas hold a high value and several comments were received from the public concerning management within roadless areas. This analysis examines the values of two roadless areas and three smaller unroaded areas that may be affected by this proposed project.

1.8.1.1 Issue 1 Units of Measure

To respond to this issue, alternatives will be compared according to how they affect acres and values of the two roadless areas and the three smaller unroaded areas within the Kuiu Timber Sale Area. This evaluation will display the number of acres of proposed harvest and miles of road construction within the roadless and unroaded areas, their potential for wilderness recommendation, and the changes to existing values as identified in the Forest Plan SEIS.

1.8.2 Issue 2 – Wildlife Habitat and Subsistence

This issue relates to cumulative effects on wildlife habitat and connectivity from past, present, and proposed activities, and the resulting effects on subsistence uses.

The Forest Plan conservation biology strategy includes a forest-wide network of large, medium, and small old-growth habitat reserves. How these reserves are connected by old-growth habitat corridors is an important part of the strategy. The location and quality of the habitat corridors linking the reserves is important, as is the location and habitat of the small old-growth habitat reserves. Timber harvest and road construction could affect corridors connecting old-growth habitat.

The cumulative reduction of high value winter range for Sitka black-tailed deer from past, present, and proposed timber harvest may have adverse effects on the availability of deer for subsistence and may

result in a significant possibility of a significant restriction to subsistence hunting and/or a reduction in prey species for wolves. Sitka black-tailed deer are also a Forest Plan Management Indicator Species (MIS) that represents the habitat needs of several old-growth wildlife species that require low elevation, high volume habitat (see Issue 2: Wildlife Habitat and Subsistence, in Chapter 3).

The black bear is an important game animal in Southeast Alaska. On Kuiu Island, black bear hunting is an important source of revenue. Bears may be negatively affected by loss of old-growth habitat, fragmentation, and increased road density.

Wolves experience higher mortality from hunting and trapping in Wildlife Analysis Areas (WAAs) with higher open road densities (Person et al. 1996).

1.8.2.1 Issue 2 Units of Measure

Connectivity will be analyzed through the effectiveness of the Forest Plan conservation biology strategy and the network of large, medium, and small old-growth habitat reserves on North Kuiu Island.

Two options for the design of the small old-growth habitat reserves (small OGRs) in or near the Kuiu Timber Sale Area (VCUs 398, 399, and 402) will be analyzed for each VCU. Option 1 is the Forest Plan design. Option 2 is an interagency design using old-growth habitat reserve criteria from Appendix K of the Forest Plan and several site-specific factors. The existing Forest Plan small old-growth habitat reserve values will be compared to the interagency recommendation.

Effects of timber harvest on Sitka black-tailed deer habitat will be evaluated by using the deer habitat capability model to measure the effects of the alternatives on acres of high value deer habitat and potential deer carrying capacity of the project area, and comparing model results to historic and current hunting effort data from ADF&G.

The effect of open road density on black bears and wolves will be analyzed by comparing the changes in open road density by alternative to the known effects of open road density on bears and wolves.

1.8.3 Issue 3 – Timber Harvest Economics

This issue relates to the economic viability of the proposed timber sale or sales. It also relates to the potential local employment and the revenue generated for communities in the local area. If proposed timber harvest alternatives are not designed to be economically viable across fluctuating market conditions, there is concern that the forest products industry in Southeast Alaska cannot remain viable.

1.8.3.1 Issue 3 Units of Measure

Comparison of alternatives for this issue will include the amount (volume) of timber harvested, the value of the timber to be removed (stumpage values), the number of direct jobs and estimated direct income generated (present net value), the logging costs, and the anticipated contributions to the regional economy.

1.8.4 Issue 4 – Cumulative Watershed Effects

Watersheds within the project area have high values for fisheries. In two of these watersheds, over 20 percent of the watershed area has been harvested within the past 30 years, and in another, approximately 19.8 percent of the watershed area has been harvested. The cumulative effects of harvest and road building within the Kuiu Timber Sale Area may affect the condition of stream channels draining these watersheds.

Identification of cumulative watershed effects as a significant issue in this project necessitated detailed watershed analysis for all major watersheds within the project area. (See "Watershed Analysis for the Kuiu Landscape Assessment" in Appendix C of this EIS). The level of detail in each watershed analysis corresponds to the perceived level of cumulative risk associated with past, present and future projects.

1.8.4.1 Issue 4 Units of Measure

To respond to this issue, alternatives will be compared according to:

- acres of proposed cumulative timber harvest within each major watershed (expressed as a percentage of watershed area),
- linear miles of temporary road construction, and
- linear miles of classified roads to be placed in storage.

The first two measures are indicators of the potential negative effects of each alternative on water quality and fish habitat. The third measure is an indicator of the degree to which implementation of an alternative may benefit water quality and fish habitat. The analysis of cumulative watershed effects will also make use of:

- the Sediment Risk Index, a measure for comparing the risk that landslides will cause stream channel changes in each watershed,
- an analysis of current stream channel conditions compared to the Tongass Fish Habitat Objectives, and
- projections of watershed recovery rates, based on calculations of future cumulative harvest levels using a 30-year window.

1.9 Other Issues and Concerns

Many comments received during the public scoping process concerned issues that are not considered significant. Some are already addressed through other processes or in the Forest Plan (see Design Criteria Common to All Alternatives, Section 2.3 in Chapter 2), or their resolution is beyond the scope of this project. As needed, resource effects related to these concerns are discussed in Chapter 3.

1.9.1 Issues Beyond the Scope of this EIS

Some comments received during scoping are not specific to the project or concern decisions that are made at a higher level of planning. These comments are paraphrased and addressed below.

1.9.1.1 No more logging or road building on National Forest Lands, the Tongass National Forest and/or Kuiu Island

There is a long legislative recognition that timber harvest is one of the appropriate activities on National Forests, starting with the founding legislation for National Forests in 1897. The National Forest Organic Act provides that National Forests may be established "to improve and protect the forest within the boundaries of, or for the purposes of securing favorable conditions of water flows and to furnish a continuous supply of timber for the use and necessities of the citizens of the United States."

Congress's policy for National Forests, as stated in the Multiple-Use Sustained Yield Act of 1960, is "the National Forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes." Accordingly, Congress has authorized the Secretary of Agriculture to sell trees and forest products from the National Forests "at no less than appraised value." The National Forest Management Act directs that forest plans shall "provide for multiple use and sustained yield, and in particular, include coordination of outdoor recreation, range, timber, watershed, wildlife, fish and wilderness."

This was one of the significant issues raised during the development of the Forest Plan. During that forest planning process, a wide array of alternatives was developed and analyses were conducted to estimate the effects of those alternatives. The selected alternative documented in the Forest Plan Record of Decision permitted timber harvest to occur in certain areas on the forest. The majority of the Kuiu Timber Sale Area is allocated to the Timber Production Land Use Designation, where timber harvest is permitted.

The No-Action Alternative for this EIS responds to this issue by not proposing timber harvest in the project area.

1.9.1.2 Protect all old-growth forests

The guidelines for management of old-growth forests are developed at the Forest Plan level. During the Forest Plan analysis, various strategies were analyzed for the protection of old-growth. This resulted in the forest-wide old-growth habitat reserve system. Other old-growth forests are protected by non-development land use designations, such as Semi-remote Recreation or Riparian, Beach, and Estuary Fringe Standards and Guidelines. Some old-growth is designated as available for timber harvest by development LUDs, such as Timber Production, Scenic Viewshed, and Modified Landscape.

1.9.1.3 No clearcutting (even-aged management)

The Forest Plan recognizes that there are silvicultural reasons to clearcut. These include: creating a fast growing stand of trees to maximize wood fiber production, minimizing the occurrence of potentially adverse impacts such as logging damage, and reducing the potential of windthrow damage, which can occur when residual trees are left in harvest units.

The Forest Plan estimated that clearcutting, using even-aged management, would dominate regeneration timber harvesting (approximately 80 percent). Forest Plan standards and guidelines, as well as the conservation strategy, were developed around this estimate.

1.9.1.4 Project Area is already over harvested; don't harvest anymore in the area

The Forest Plan allocates LUDs to provide for various resource uses. The Forest Plan predicts that 54 percent of the productive old-growth will remain within Wildlife Analysis Area (WAA) 5012 (in which the project area is located) at the end of the planning horizon (Forest Plan FEIS Part 1, p.3-387). Thirty-seven percent of the WAA is within old-growth habitat reserves and will not be harvested. About 23 percent of the project area acres have already been harvested. In addition, approximately 32 percent of the acres in the Timber Production LUD in the project area are unsuitable for harvest. The area is well within the Forest Plan predictions.

1.9.1.5 Analyze the impacts of the project on carbon sequestering

The Forest Plan determined that because of the small area of land involved, and the high degree of reforestation following logging, land use practices in the temperate rainforest zone of Southeast Alaska are expected to have no measurable effect on carbon sequestration. At the project level, the effects would be even less, and any attempt to quantify them would be arbitrary.

1.9.1.6 Identify the number of logging jobs that would be filled by seasonal, non-resident workers

While this document provides an estimate of the number of jobs created by each alternative (Issue 3: Timber Sale Economics in Chapter 3), it is not possible to predict with any degree of reliability the residency of those who would fill the jobs that might be created by a particular timber sale.

1.10 State and Federal Agency Review

Alaska Coastal Management Act of 1977

The Alaska Coastal Management Act of 1977 contains standards and criteria for a consistency determination for activities within the coastal zone. The Alaska Coastal Management Plan incorporated the Alaska Forest Resources and Practices Act standards and guidelines for timber harvesting and processing. The Forest Service standards and guidelines described in Chapters 2 and 3 of this document are comparable to or exceed State standards.

Coastal Zone Management Act of 1972

All alternatives comply with the Federal Coastal Zone Management Act of 1972 (CZMA). Federal lands are not included in the definition of the coastal zone as prescribed in the CZMA. However, the Act requires that when federal agencies conduct activities or developments that affect the coastal zone, the activities or development must be consistent to the maximum extent practicable with the approved State Coastal Management Program.

A Memorandum of Understanding between the State of Alaska and the Regional Forester, dated March 2, 2000, outlines standards for the consistency evaluation. The following standards are included in the agreement:

- Alaska Statute Title 46, Water, Air, Energy, and Environmental Conservation
- Alaska Forest Practices Act of 1993
- The District Coastal Management Program

The Forest Service has made the required consistency determination, which is included in this EIS in the Disclosures section of Chapter 3. A review will be coordinated through the Alaska Department of Natural Resources, Office of Project Management and Permitting to determine if the state agencies agree with the Forest Service's determination of

consistency with the Alaska Coastal Management Program (ACMP). The State's response will be reported in the Final EIS for this project.

Alaska Forest Resources and Practices Act

The Alaska Forest Resources and Practices Act (1993) affects National Forest management through its relationship to the ACMP and the CZMA.

This Act is the standard used for evaluating timber harvest activities on federal lands for purposes of determining consistency to the maximum extent practicable with the ACMP. The Act recognizes that consistency is attainable for timber harvest on federal land using procedures different from those required by the Act or its implementing regulations.

Magnuson-Stevens Fishery Conservation Act

The Magnuson-Stevens Fishery Conservation Act (1996) requires that all federal agencies consult with the National Marine Fisheries Service (NMFS) when any project "may adversely affect" essential fish habitat. NMFS will review this Draft EIS to determine if the Agency concurs with the Forest Service's Essential Fish Habitat assessment. The results of this review will be reported in the Final EIS for this project.

National Historic Preservation Act (Section 106)

The State of Alaska, State Historic Preservation Officer (SHPO) reviews compliance with Section 106 of the National Historic Preservation Act, a process to determine the effects of the alternatives on heritage resources.

1.11 Federal and State Permits, Licenses, and Certifications

To proceed with the activities proposed in this EIS, various permits from other federal and state agencies may be required. The following permits have been or will be obtained.

U.S. Army Corps of Engineers

Section 404 of the Clean Water Act (1977, as amended) requires a permit from the Corps of Engineers before filling or dredging in wetlands and tidelands. Section 10 of the Rivers and Harbors Act of

1899 requires Corps of Engineers approval for the construction of structures or work in navigable waters of the United States. This applies to the existing Rowan Bay and Saginaw Bay Log Transfer Facilities (LTFs), for which permits have been obtained. All roads proposed for this project meet the criteria for a silvicultural exemption from permits required by Section 404.

U.S. Environmental Protection Agency

A Storm Water Discharge Permit and a permit for discharge of bark and wood debris (Section 402 of the Clean Water Act) has been obtained. Both of these permits are required for the Rowan Bay and Saginaw Bay LTFs. The contractor will be responsible for obtaining the necessary stormwater discharge permits for log storage and handling at the LTF(s), and for construction activities that disturb more than one acre.

State of Alaska, Department of Natural Resources

Use of the Rowan Bay and Saginaw Bay LTFs requires authorization for occupancy and use of tidelands and submerged lands from the Alaska Department of Natural Resources. This permit has been obtained.

State of Alaska, Department of Environmental Conservation

A Certification of Compliance with Alaska Water Quality Standards (Section 401 Certification) has been obtained for the Rowan Bay and Saginaw Bay LTFs.

1.12 Applicable Laws and Executive Orders

This section includes a partial list of federal laws and executive orders pertaining to project-specific planning and environmental analysis on federal lands. Disclosures and findings required by these laws and orders are found at the end of Chapter 3.

- Organic Administration Act of 1897 (as amended)
- Rivers and Harbors Act of 1899
- Migratory Bird Treaty Act of 1918 (as amended)
- Multiple-Use Sustained-Yield Act of 1960
- National Historic Preservation Act of 1966 (as amended)

- Wild and Scenic Rivers Act of 1968, amended 1986
- 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 (ESA) of 1973 (as amended)
- Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (as amended)
- National Forest Management Act (NFMA) of 1976 (as amended)
- Clean Water Act of 1977 (as amended)
- Coastal Zone Management Act (CZMA) of 1972 (as amended)
- American Indian Religious Freedom Act of 1978
- Alaska National Interest Lands Conservation Act (ANILCA) of 1980
- Archeological Resource Protection Act of 1980
- Cave Resource Protection Act of 1988
- Native American Graves Protection and Repatriation Act (1990)
- Tongass Timber Reform Act (TTRA) of 1990
- Magnuson-Stevens Fishery Conservation and Management Act of 1996
- Executive Order 11593 (cultural resources)
- Executive Order 11988 (floodplains)
- Executive Order 11990 (wetlands)
- Executive Order 12898 (environmental justice)
- Executive Order 12962 (aquatic systems and recreational fisheries)
- Executive Order 13007 (American Indian Sacred Sites)
- Executive Order 13186 (Migratory Bird Treaty)

Chapter 2
Alternatives

Chapter 2
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Chapter 2
Alternatives

2.1 Introduction

This chapter describes and compares the alternatives considered by the Forest Service for the Kuiu Timber Sale to meet the Purpose and Need and respond to the significant issues as described in Chapter 1. The following topics are discussed:

- the development of the Proposed Action and alternatives,
- a description and map of each alternative considered in detail,
- an overview of design elements,
- a comparison of the alternatives focusing on the evaluation criteria for the significant issues,
- alternatives eliminated from detailed study, and
- mitigation and monitoring.

Chapter 2 presents the alternatives in comparative form to inform the public and other agencies, and to provide a basis for a decision by the responsible official (40 CFR 1502.14). For a more complete discussion of the effects used to compare alternatives in Chapter 2 consult Chapter 3, "Affected Environment and Environmental Consequences."

2.1.1 Proposed Action and Alternative Development

A Logging System and Transportation Analysis (LSTA) was developed to include all suitable commercial forest land as identified by the National Forest Management Act and the Forest Plan. From that LSTA, potential timber harvest units were identified. These units were field-verified to ensure their suitability, to identify any concerns, and to determine which silvicultural prescriptions would be feasible.

In response to the significant issues and comments received during scoping, the Proposed Action was modified to form five alternatives. These alternatives address the significant issues and meet the Purpose and Need. One additional alternative was considered but dropped from detailed analysis. In addition, development of the alternatives led to deferring many potential timber harvest units from further consideration at this time.

2.2 Alternatives Considered In Detail

The No-Action Alternative (Alternative 1), Proposed Action (Alternative 4) and three other action alternatives were considered in detail. Figures 2-1 through 2-5 display the five alternatives. Tables 2-1 and 2-2 compare the proposed activities and effects of the alternatives.

2.2.1 Alternative 1 (Figure 2-1)

This alternative proposes no timber harvest, road construction, changes to the road management objectives, or other activities within the Kuiu Timber Sale Area at this time. It represents the existing condition of the Kuiu Timber Sale Area. It does not preclude future timber harvest or other activities from this area.

2.2.2 Alternative 2 (Figure 2-2)

This alternative was developed to minimize impacts to wildlife and watersheds, and have no impact to roadless areas. The proposed timber harvest would result in the production of approximately 14.6 million board feet (mmbf) of timber from approximately 491 acres. Only ground-based logging systems would be used. The amount of trees remaining in a unit after harvest would vary from zero to fifty percent of the stand's pre-harvest basal area.

Where high wildlife values are identified, approximately 50 percent of the stand basal area would be retained to provide cover and structure for wildlife habitat. Harvest units in the Recreational River LUD would retain 50 percent of the stand basal area to retain scenic values. Logs would be transported to existing log transfer facilities (LTFs) in either Saginaw Bay or Rowan Bay. The Saginaw Bay LFT would require some reconstruction before use.

Approximately 2.9 miles of temporary road construction would be necessary for timber harvest. No new long-term use classified roads would be constructed. Temporary road construction would not cross any Class I or II fish streams in this alternative. The reconstruction of closed roads would require the installation of three crossing structures on Class I streams, and three crossing structures on Class II streams. Temporary road construction and closed road reconstruction would require placement of one crossing structure on a Class III stream, and five crossing structures on Class IV streams. These culverts or bridges would be removed upon completion of harvest activities.

After timber harvest is complete, 8.2 miles of currently open roads that would be used to access timber for this project would be closed to motorized traffic and placed in storage with stream crossing structures removed (Roads 6413, 46096, and 46021). Additionally, approximately 4.5 miles of roads currently in storage (Roads 6417, 46091, 46094, and 6443) would be opened and reconstructed to access timber. After harvest, these roads would be returned to storage

condition with all stream crossing structures removed and closed to motorized traffic.

2.2.3 Alternative 3 (Figure 2-3)

This alternative was developed by modifying Alternatives 2 and 4 to reduce impacts to resources such as wildlife, hydrology, and fisheries while providing a larger economic return. The proposed timber harvest would result in the production of approximately 23.6 million board feet (mmbf) of timber from approximately 794 acres. Only ground-based logging systems would be used. The amount of trees remaining in a unit after harvest would vary from zero to fifty percent of the stand's pre-harvest basal area.

Where high wildlife values were identified, approximately 50 percent of the stand basal area would be retained to provide structure for wildlife habitat. Logs would be transported to existing log transfer facilities (LTFs) in either Saginaw Bay or Rowan Bay. The Saginaw Bay LTF would require some reconstruction before use.

Approximately 7.5 miles of temporary road construction would be necessary for timber harvest. No new classified roads would be constructed. One bridge would be placed across a Class II fish stream on a temporary road to reduce impacts to fish. The bridge would be removed after timber harvest activities are completed. The reconstruction of closed roads would require the installation of two crossing structures on Class I streams and three crossing structures on Class II streams. Temporary road construction and closed road reconstruction would require placement of eight crossing structures on Class III streams, and 19 crossing structures on Class IV streams. All culverts or bridges would be removed upon completion of harvest activities.

After timber harvest is complete, 8.4 miles of currently open roads that would be used to access timber for this project would be closed to motorized traffic and placed in storage with all stream crossing structures removed (Roads 6413, 46096, and 4618). Additionally, 3.2 miles of roads currently in storage that would be opened and reconstructed to access timber would be closed to motorized traffic and returned to storage condition with all stream crossing structures removed (Roads 6417, 46091, and 46094).

2.2.4 Alternative 4 Proposed Action (Figure 2-4)

The Proposed Action for the Kuiu Timber Sale would result in the production of approximately 42.6 million board feet (mmbf) of timber from approximately 1,425 acres. A mix of ground-based and helicopter logging systems would be used. Helicopter logging would be used to access units on steeper ground. Using helicopters reduces the need for road construction and allows a more selective harvest on steeper slopes. The amount of trees remaining in a unit after harvest would vary from zero to fifty percent of the stand's pre-harvest basal area.

Where helicopter logging is necessary to access the standing timber, trees less than 16 inches diameter at breast height (DBH) and western hemlock greater than 36 inches DBH would be left standing to improve economics. Where high wildlife values were identified, approximately 50 percent of the stand basal area would be retained to provide cover and structure for wildlife habitat. Harvested units in the Recreational River LUD would retain 50 percent of the stand basal area. Logs would be transported to existing log transfer facilities in either Saginaw Bay or Rowan Bay. The Saginaw Bay LTF would require some reconstruction before use.

Approximately 19 miles of temporary road construction would be necessary for timber harvest. No new classified roads would be constructed. Temporary road construction would require the installation of two crossing structures across Class II fish streams. The reconstruction of closed roads would require the installation of three crossing structures on Class I streams, and three crossing structures on Class II streams. Temporary road construction and closed road reconstruction would require placement of 14 crossing structures on Class III streams, and 19 crossing structures on Class IV streams. All culverts or bridges would be removed upon completion of harvest activities.

After timber harvest is complete, 11 miles of roads that are currently open and that would be used to access timber for this project would be closed to motorized traffic and placed in storage with all stream crossing structures removed (Roads 6413, 46096, 46021, 6418, and a portion of 6427). Additionally, 6.1 miles of roads currently in storage that would be opened and reconstructed to access timber would be closed to motorized traffic and returned to storage condition with all stream crossing structures removed (Roads 6417, 46091, 6422, 6443, and a portion of 6427).

2.2.5 Alternative 5 (Figure 2-5)

This alternative proposes only even-aged management with clearcut harvesting of timber to increase the economic return. The proposed timber harvest would result in the production of approximately 36.3 million board feet (mmbf) of timber from approximately 1,231 acres. Only ground-based logging systems would be used. Logs would be transported to existing log transfer facilities in either Saginaw Bay or Rowan Bay. The Saginaw Bay LTF would require some reconstruction before use.

Approximately 17.1 miles of temporary road construction would be necessary for timber harvest. No new classified roads would be constructed. Temporary road construction would require the installation of two crossing structures across Class II fish streams. The reconstruction of closed roads would require the installation of three crossing structures on Class I streams, and three crossing structures on

Class II streams. Temporary road construction and closed road reconstruction would require placement of 15 crossing structures on Class III streams, and 18 crossing structures on Class IV streams. All culverts or bridges would be removed upon completion of harvest activities.

After timber harvest is complete, 11 miles of currently open roads that would be used to access timber for this project would be closed to motorized traffic and placed in storage with all stream crossing structures removed (Roads 6413, 46096, 46021, 6418, and a portion of 6427). Additionally, 6.9 miles of roads currently in storage that would be opened and reconstructed to access timber would be closed to motorized traffic and returned to storage condition with all stream crossing structures removed (Roads 6417, 46091, 46094, 6422, 6443, and a portion of 6427).

2.3 Design Criteria Common to All Action Alternatives

All alternatives, including the Proposed Action, are consistent with the Tongass Land and Resource Management Plan. All applicable Forest Plan standards and guidelines have been incorporated into the design of the proposed units and alternatives. Additional direction comes from applicable laws and Forest Service manuals and handbooks. Site-specific descriptions and resource considerations for each potential harvest unit are included as unit cards in Appendix B of this EIS. These unit cards serve as the prescription or design narrative for the project. Design elements for the reconstruction and maintenance needed for existing classified roads are also described in detail in Appendix B.

The design elements required from the Forest Plan and common to all alternatives are listed below.

2.3.1 Biodiversity and Old-growth

Each alternative complies with the Forest Plan conservation biology strategy. The strategy was designed to ensure well-distributed viable populations of wildlife.

The small old-growth habitat reserves (OGRs, Old-growth Habitat LUD) mapped in the Forest Plan FEIS have been evaluated for size, spacing, and habitat composition. An interagency review by biologists from the USDA Forest Service, Alaska Department of Fish and Game (ADF&G), and the U.S. Fish and Wildlife Service (USFWS) determined that alternative small OGRs within Value Comparison Units (VCUs) 398, 399, and 402 would better meet the requirements for size, connectivity, and acres of productive old-growth habitat. The review team recommended that the boundaries of the existing small

OGRs be adjusted. All action alternatives would require a non-significant Forest Plan Amendment to adopt these recommendations.

The modified OGR for VCU 398 would be approximately 2,305 acres, compared to 2,237 acres identified in the Forest Plan.

The modified OGR for VCU 399 would be approximately 4,159 acres, compared to 2,628 acres identified in the Forest Plan.

The modified OGR for VCU 402 would be approximately 5,273 acres, compared to 4,044 acres identified in the Forest Plan.

2.3.2 Beach and Estuary Fringe

Beach and estuary fringes extend 1,000 feet inland from mean high tide along all marine coastlines. The Forest Plan classifies the beach and estuary fringe as unsuitable for timber harvest (Forest Plan p. 4-5). No timber harvest or new roads are proposed at Saginaw Bay or Security Bay, which are the only beach and estuary fringes in the project area.

Saginaw Bay LTF may be used. This LTF would require reconstruction in order to accommodate log transfer from the sort yard to the barge without floating logs. The "footprint" of the LTF would not change.

Rowan Bay is outside the project area, but the existing LTF and sort yard may be used for this project. No additional road building or development of the LTF would occur for this project at Rowan Bay.

2.3.3 Fish Habitat and Water Quality

Forest Plan standards and guidelines for riparian areas are applied to all fish streams and to non-fish-bearing Class III and Class IV streams within the Kuiu Timber Sale Area. These areas are delineated according to the process group direction in the Forest-wide riparian standards and guidelines. This protection exceeds the requirements of the Tongass Timber Reform Act (TTRA), which mandates at least a 100-foot buffer zone where no commercial timber harvest can occur on each side of all Class I streams and on Class II streams that flow directly into Class I streams. No Riparian Management Area (RMA) buffers were adjusted for this project, and no timber harvest is proposed within any RMA for this project. Best Management Practices (BMPs) would be implemented to minimize the risk of land management activities impairing water quality on streams that are likely to require specific protection measures during implementation. Protection measures may include timing restrictions for in-stream activities, or site-specific design of stream crossing structures. Any activities that occur on classified roads are addressed on the Road Cards in Appendix B.

Appendix B site-specific design criteria for road management objectives show the timing restrictions for in-stream activities such as the replacement of bridges (See Table B-3 in Appendix B). Timing

windows for in-stream work for temporary roads and/or replacement of bridges would be coordinated with the Alaska Department of Fish and Game.

All Best Management Practices would be incorporated during sale design and harvest administration. A National Pollutant Discharge Elimination System permit has been obtained for the Rowan Bay and Saginaw Bay LTFs. This permit provides for protection of water quality by eliminating discharge of surface water directly from the working area to the environment through the use of settling ponds and a drainage system.

Operators who maintain storage facilities for oil or oil products in the sale area would take appropriate preventive measures to ensure that spills do not occur. If a spill did occur, action would be taken using emergency response materials to prevent petroleum products from entering any stream or other waters. A Spill Prevention Control and Countermeasures (SPCC) Plan that meets applicable EPA requirements would be prepared and maintained. Timber sale administrators would inspect petroleum storage facilities and the Purchaser's SPCC for prevention of spills, and to ensure prepared emergency response plans are in place.

2.3.4 Soils

Field inspections located a few areas inside proposed timber harvest units with slopes greater than 72 percent. On-site stability analyses, documented in the planning record, showed that these areas are stable enough for timber harvest to occur. Harvest settings would be designed to achieve partial or full suspension where needed to minimize soil disturbance.

Temporary road locations would avoid slopes greater than 67 percent, unstable areas, and slide-prone areas. Soil exposed after temporary road construction would be seeded in a timely manner.

2.3.5 Wetlands

Temporary roads would be located and designed to avoid or minimize effects to wetlands where possible. Where temporary roads would cross wetlands, shot rock would be used. Any drainage structures would be designed to ensure that subsurface flow is not restricted.

2.3.6 Scenery

Proposed harvest units and treatments have been designed and prescribed to meet visual quality objectives in the Forest Plan for the applicable land use designation.

2.3.7 Threatened, Endangered and Sensitive Species

Biological evaluations for all sensitive wildlife and plant species potentially inhabiting the project area have been completed. The Forest Plan contains standards and guidelines for each designated sensitive species, and these are incorporated into the proposed project as applicable.

A Biological Assessment will be completed. Any standards and guidelines would be applied as needed to ensure that any listed species population or its habitat would not be adversely affected.

Goshawk field surveys were conducted on Kuiu Island since 1993 and in the Kuiu Timber Sale Area in 2003, 2004, and 2005. Two nests have been located and monitored within the Kuiu project area. An active nest was discovered in 1997 in the Saginaw Medium Old-growth Habitat Reserve. Surveys in 2003 and 2004 did not find any nesting activity in the area. A second nest was found in Rowan Bay in 1993. It has not been observed as active since then. No activities are proposed in or near these areas.

Forest Plan standards and guidelines specify a buffer of not less than 100 acres of productive old-growth around any nest tree or probable nest site. If any nest sites are discovered in the area of proposed activities, these standards and guidelines will be applied.

2.3.8 Biodiversity

The small old-growth habitat reserves in VCUs 398, 399, and 404 mapped in the Forest Plan have been evaluated for size, spacing, and habitat composition. Design options for these reserves were created, and timber harvest alternatives were designed to accommodate these options.

2.3.9 Wildlife Habitat

Where even-aged management clearcutting has been identified as the best silvicultural prescription to meet the objectives of the alternatives and Forest Plan management prescription, unmerchantable trees would be retained where safe to do so to create future stand structure. No even-aged management openings over 100 acres in size would be created.

Green trees retained to mitigate effects to resources other than timber would be located to minimize their effects on the logging operation.

2.3.10 Windthrow

Windthrow risks have been evaluated, and means to minimize windthrow were incorporated into the proposed harvest unit prescriptions.

2.3.11 Heritage Resources

All identified heritage resources have been avoided. The Forest Service has made a determination of no effect and has received concurrence from the Alaska State Historic Preservation Officer for all proposed activities.

If previously undiscovered archaeological sites are found during implementation, activities would cease until a qualified archaeologist can evaluate the site and, if necessary, develop mitigation measures in consultation with the Alaska State Historic Preservation Officer.

2.3.12 Log Transfer Facility (LTF) and Sort Yard

The existing permitted log transfer facility (LTF) at Rowan Bay, approximately five miles to the south of the project area, may be used. In addition, an existing sort yard located near the LTF on the uplands would be used if necessary.

An alternative permitted LTF may be used at Saginaw Bay. This LTF would require reconstruction, but the "footprint" of the LTF would not change. An existing sort yard located near the LTF on the uplands would be used if necessary.

2.3.13 Logging Camps

An area for a land-based logging camp, at Rowan Bay, about six miles south of the project area, has been in use intermittently since the 1980s and could be used with the appropriate permits. A floating logging camp would also require permits. No camp is planned at Saginaw Bay.

2.4 Design Criteria Specific to Certain Alternatives

2.4.1 High Wildlife Use

In Alternatives 2 and 3, and to a lesser extent in the Proposed Action (Alternative 4), retention of 50 percent of the basal area of the stand is proposed in harvest units where comparatively high wildlife use (deer, moose, and bear) has been identified.

2.4.2 Logging Economics

For the units logged by helicopter in Alternative 4, all trees less than 16 inches DBH and western hemlock greater than 36 inches DBH would be left standing where safe to do so to improve helicopter yarding economics.

2.4.3 Recreational River LUD

In Alternatives 2 and 4, 50 percent basal area retention is proposed to maintain a natural-appearing scenic quality for those units located in the Recreational River LUD.

Table 2-1. Kuiu Timber Sale Area proposed activities by alternative

Proposed Activity		Alternative				
		1	2	3	4	5
Acres of Timber Harvested by Treatment						
Even-aged Management	Clearcut	0	197	409	1,026	1,231
Uneven-aged Management	Single tree selection - 50% basal area retention	0	87	72	215	0
	Group selection -50% basal area retention	0	19	19	42	0
Two-aged Management	Clearcut with reserves – 50% basal area retention	0	188	294	142	0
Total Acres		0	491	794	1,425	1,231
Acres of timber harvest by logging system						
Cable		0	408	759	1,108	1,082
Shovel		0	83	35	147	149
Helicopter		0	0	0	170	0
Miles of road maintenance/construction						
Maintenance: miles of open classified roads		56.2	48.0	47.8	45.2	45.2
Reconstruction: existing classified roads (closed after harvest)		0	4.5	3.2	6.1	6.9
Construction: temporary roads (closed after harvest)		0	2.9	7.5	19.0	17.1
Miles of road closure						
Classified roads currently drivable		0	8.2	8.4	11.0	11.0

2.5 Comparison of Alternatives

The following discussion focuses on how each alternative responds to each significant issue. The existing condition will change over time for some resources even if no proposed activities are implemented. Table 2-2 at the end of this section compares alternatives in terms of their effects on each resource analyzed. For a complete discussion of the significant issues and other environmental considerations, refer to Chapter 3.

2.5.1 Issue 1 – Roadless Areas

This issue relates to timber harvest and the construction of new roads to facilitate timber harvest in roadless areas or in the smaller unroaded areas (Figure 3-1). Additional roads and timber harvest could result in educing the amount of roadless acreage within the project area, and could affect roadless area values as identified in the Forest Plan SEIS.

Alternatives 1 and 2 are the only alternatives with no proposed timber harvest or road construction within the North Kuiu Roadless Area, and no units within 600 feet of, or proposed roads within 1,200 feet of, the edge of the roadless area (refer to the discussion under Issue 1 – Roadless Areas, in Chapter 3).

Alternatives 3, 4, and 5 propose timber harvest and temporary road construction within the North Kuiu Roadless Area.

In Alternative 3 approximately 67 acres (8 percent) of the 794 acres proposed for harvest are in the North Kuiu Roadless Area and 0.2 mile of temporary road construction is proposed in the roadless area. Alternative 3 would also result in a total of 258 acres removed from the roadless area, including the 600-foot and 1,200-foot buffers.

In Alternative 4 approximately 210 acres (15 percent) of the 1,425 acres proposed for harvest are in the North Kuiu Roadless Area and 0.95 mile of temporary road construction is proposed in the roadless area. Alternative 4 would result in the most acres (662) removed from the roadless area, including the 600-foot and 1,200-foot buffers.

In Alternative 5 approximately 114 acres (9 percent) of the 1,231 acres proposed for harvest are in the North Kuiu Roadless Area and an additional 0.95 mile of temporary road construction is proposed in the roadless area. Alternative 5 would also result in a total of 404 acres removed from the roadless area, including the 600-foot and 1,200-foot buffers.

For Alternatives 3, 4, and 5 the overall size of the North Kuiu Roadless Area would be reduced. However, the area would still be eligible for inclusion in the National Wilderness Preservation System

and the values identified for the roadless area as defined in the Forest Plan SEIS would be retained.

There are three smaller unroaded areas within the project area, totaling approximately 8,723 acres. Alternatives 1 and 2 would not harvest timber or build any roads within these unroaded areas. Alternative 3 proposes harvest in 68 acres within these areas and construction of 0.64 mile of temporary road. Alternatives 4 and 5 propose harvest in 167 acres and construction of 0.74 mile of temporary road in the unroaded areas.

The primary effect on the unroaded areas would be visual disturbance in the viewshed for areas close to the proposed harvest units.

2.5.2 Issue 2 – Wildlife Habitat and Subsistence

This issue relates to cumulative effects on wildlife habitat from past, present, and proposed activities and the potential corresponding effect to subsistence hunting.

Small OGRs would not be adjusted under Alternative 1. All action alternatives would adjust the small OGRs as follows:

- The small OGR in VCU 398 would lose approximately 222 acres of productive old-growth (POG) but would become less fragmented. Its shape would improve from linear to circular.
- The small OGR in VCU 399 would gain approximately 1,384 acres of POG and would become less fragmented.
- The small OGR in VCU 402 would gain approximately 1,022 acres of POG and would contain more acres of coarse canopy old-growth habitat.

Alternative 2 would harvest the least amount of POG (484 acres), with 294 acres retaining 50 percent of the stand's pre-harvest basal area. Alternative 3 would harvest 783 acres of POG, with 385 acres retaining 50 percent of the stand's pre-harvest basal area. Alternative 4 would harvest the most POG (1,402 acres), with 399 acres retaining 50 percent basal area. Alternative 5 would harvest 1,206 acres of POG, clearcutting 100 percent of the acres harvested.

Low elevation productive old-growth has a high value for many wildlife species. Alternative 2 would harvest 245 acres of high value habitat of which 151 acres would retain 50 percent of the stand's pre-harvest basal area. Alternative 3 would harvest the least amount of high value habitat (237 acres), of which 146 acres would retain 50 percent of the stand's pre-harvest basal area. Alternative 4 would harvest the most high value habitat (481 acres), of which 138 acres would retain 50 percent of the stand's pre-harvest basal area. Alternative 5 would harvest 449 acres of high value habitat, all of which would be clearcut.

Open road densities in the project area would be reduced from 0.78 mile per square mile in all action alternatives. Alternatives 4 and 5 would place the most miles of road into storage, resulting in an open road density of 0.63 mi/mi^2, followed by Alternative 3 (0.66 mi/mi^2) and Alternative 2 (0.67 mi/mi^2).

Subsistence, an Alaska concern and a right protected by law, is a significant issue. The Kuiu Timber Sale Area analysis addresses this issue by comparing the timber harvest alternatives in terms of their effects on the following old-growth habitat values in the project area:

- Acres of coarse canopy old-growth remaining in the project area after proposed harvest
- Acres of high value habitat (POG below 800 feet in elevation) that will be clearcut harvested
- Acres of high value deer habitat in the project area

Coarse canopy old-growth is valuable wildlife habitat. Approximately 51 percent of the original coarse canopy old-growth in the project area has been previously harvested. There are currently 13,009 acres of coarse canopy old-growth within the project area. Alternative 4 would harvest the most coarse canopy; 813 acres (six percent of the current acres). Alternatives 2 and 3 would harvest the fewest acres of coarse canopy old-growth; 228 and 334 acres respectively (three percent of the current acres of coarse canopy). Alternative 5 would harvest four percent of the existing coarse canopy old-growth in the project area (553 acres).

Since 1954, there has been a 39 percent reduction in high value deer habitat (habitat suitability index (HSI 0.6-1.0) within Wildlife Analysis Area (WAA) 5012 and a 49 percent reduction in high value deer habitat (HSI 0.6-1.0) in the project area. At most, the action alternatives would reduce the high value deer habitat within the project area by an additional five percent. The deer winter habitat capability of the project area has been reduced approximately 31 percent from historic levels. At most, the winter habitat would be reduced an additional four percent in Alternatives 4 and 5. At the least, the deer winter habitat capability would be reduced by an additional two percent in Alternative 2. Alternative 3 would reduce the deer winter habitat capability by three percent.

Among the action alternatives, Alternative 2 responds best to meeting wildlife and subsistence needs. Alternatives 4 and 5 would retain the least amount of habitat.

2.5.3 Issue 3 – Timber Harvest Economics

This issue relates to the economic viability of the proposed timber sale or sales. It also relates to the potential local employment and revenues generated for local communities. If proposed timber harvest alternatives are not designed to be economically viable across fluctuating market conditions, there is a concern that the forest products industry in Southeast Alaska cannot remain viable.

Timber economics depends on several factors. These factors include:

- the amount of timber harvested,
- the value of the timber harvested, and
- the cost of harvesting the timber.

More timber generally means a higher economic return and more jobs, or jobs over a longer period of time.

The value of the timber is determined by species composition, the amount of defect in the wood, and the value of the products that can be obtained from the wood. Road construction and the amount of helicopter logging are two items that increase the cost of timber harvest.

The amount of timber that would be harvested varies from none in Alternative 1 to 42.6 mmbf in Alternative 4, the Proposed Action. Alternative 5 proposes the next highest volume 36.3 mmbf. Alternatives 2 and 3 propose the lowest volumes for harvest, 14.6 mmbf and 23.6 mmbf respectively.

A financial analysis was done using the NEPA Economic Analysis Tool (NEAT) developed by the Alaska Region. For this analysis, it was assumed that all timber volume would be sold at one time. The financial analysis uses cubic feet (ccf) as a unit of measure since that is how timber volume is sold by the Forest Service. The results of the analysis were then converted to board feet, the unit of measure with which most people are familiar.

The analysis showed that all the action alternatives would have a positive expected bid value. All alternatives show a higher expected bid when the Rowan Bay LTF is used over the Saginaw Bay LTF because of reconstruction costs associated with the Saginaw Bay LTF.

If the Rowan Bay LTF is used, Alternative 5 would have the highest expected bid value of $20.59/mbf. Alternative 4 has the second highest value at $18.04/mbf. Alternative 2 has an expected bid value of $13.03/mbf. Alternative 3 has the lowest expected bid value of $8.51/mbf, due to the high ratio of partial harvest acres to the miles of temporary road construction.

If timber is hauled to the Saginaw Bay LTF, the unusual adjustments associated with the reconstruction of the LTF and sort yard are expected to lower the bid price. Alternative 5 would have the highest value of $18.19/mbf. Alternative 4 would have the second highest expected bid value of $16.21/mbf. Alternative 3 would have the second lowest bid of $3.71/mbf and Alternative 2 would have the lowest expected bid value of $3.18/mbf.

Direct employment would be the highest in Alternative 4 with 228 expected jobs. Alternative 2 would have the lowest direct employment, with 78 expected jobs.

2.5.4 Issue 4 – Cumulative Watershed Effects

This issue relates to the cumulative effects of timber harvest and construction of roads in watersheds with previous management, particularly those watersheds in which over 20 percent of the watershed area has been harvested within the last 30 years.

Because of the current condition, two watersheds are in excess of 20 percent harvested within a 30-year period, which is a threshold identified in the Forest Plan for requiring further analysis. Alternative 1 would have the least effect on all watersheds in the project area, with no timber harvest or road construction proposed. If Alternative 1 were implemented, the 30-year cumulative harvest levels would be less than 15 percent in all project area watersheds by the year 2011.

Alternatives 2 and 3 would have the same two watersheds as Alternative 1 in excess of 20 percent harvested within a 30-year period. Alternatives 4 and 5 would have three watersheds in excess of 20 percent harvested within a 30-year period. However, by the year 2011 the cumulative harvest in all watersheds in all action alternatives would be less than 16 percent. This is a direct effect of the age of the majority of the previous harvest within the watersheds (the majority of the harvest occurred in the 1960s and 1970s).

The sharp decline in the 30-year cumulative harvest levels between years 2001 and 2011 reflects a sharp decline in harvest rates within the project area since the 1960s and 1970s. Therefore, the cumulative watershed effect is a general trend toward recovery of slope stability, pre-harvest rates of canopy interception, and evapotranspiration. Under the action alternatives the proposed harvest would cause small increases in the 30-year harvest levels. However, the overall trend in 30-year cumulative harvest levels is decreasing.

2.6 Identification of the Preferred Alternative

At this point in the analysis, Alternative 4 has been identified as the Preferred Alternative. The recommendations were based on the environmental analysis and public and agency comments received to this date. The Responsible Official may select this alternative, another alternative, or a modification of one of the alternatives. The Responsible Official may also select another old-growth habitat reserve (OGR) option from the small OGR options discussed in Issue 2: Wildlife Habitat and Subsistence in Chapter 3.

2.7 Alternatives Considered but Eliminated From Detailed Study

Several alternatives were considered during the planning process, but not all have been included in the EIS for detailed study. The alternative dropped from detailed analysis is described briefly below, along with the reasons for not considering it further.

Some units within the unit pool were also eliminated from further consideration due to environmental concerns.

2.7.1 Helicopter-logging only

The possibility of developing a helicopter logging only alternative, which would eliminate the need for additional road construction, was considered at the request of U.S. Fish and Wildlife Service and other commenters. Because helicopter logging is the most expensive yarding method, using this as the only method would not allow the cost of helicopter logging to be offset by more cost-effective conventional ground-based systems, making this alternative financially inefficient. Using the NEAT economic model and given present market conditions, the economics of helicopter logging could not be made positive, even with increased timber volumes.

2.7.2 Units Dropped from the Unit Pool

Several units were dropped from consideration within any alternative. They are listed in Table 2-3 along with the rationale for elimination.

Table 2-2. Comparison of alternatives by issue and effects

Units of Measure	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Issue 1 – Roadless Areas					
Acres harvested within roadless areas	0	0	67	210	114
Miles of temporary roads constructed within roadless areas	0	0	0.2	0.95	0.95
Percent of affected area including zones of influence (600' for harvest, 1,200' for roads)	0	0	3%	7%	4%
Change in roadless characteristics?	No	No	No	No	No
Eligible for Wilderness designation?	Yes	Yes	Yes	Yes	Yes
Issue 2 – Wildlife Habitat and Subsistence					
Acres of productive old-growth maintained	27,112	26,628	26,329	25,710	25,906
Project area open road density (miles per square mile)	0.78	0.67	0.66	0.63	0.63
Acres of high value deer habitat remaining after harvest (HSI = 0.60 – 1.0)	6,824	6,696	6,694	6,513	6,578
Acres coarse canopy old-growth remaining after harvest	13,009	12,781	12,675	12,196	12,456
Acres high value wildlife POG below 800 feet that would be clearcut	0	96	90	341	446
Subsistence	Possible future restrictions based on the Forest Plan's predicted cumulative effects for subsistence hunting for deer.				

Table 2-2 (continued). Comparison of alternatives by issue and effects

Units of Measure	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Issue 3 – Timber Harvest Economics					
Amount of volume (mbf)	0	14,572	23,586	42,649	36,291
Amount of volume (ccf)	0	29,738	48,134	87,039	74,063
Expected bid ($/mbf) to Rowan Bay LTF	0	$13.03	$8.51	$18.04	$20.59
Expected bid ($/mbf) to Saginaw Bay LTF	0	$3.18	$3.71	$16.21	$18.19
Total Logging Costs per mbf (including road costs) to Rowan Bay LTF	0	$229.00	$237.02	$219.47	$211.53
Total Logging Costs per mbf (including road costs) to Saginaw Bay LTF	0	$249.10	$246.84	$223.20	$216.43
Road costs per mbf (construction and reconstruction) to Rowan Bay LTF	0	$21.85	$31.20	$27.71	$32.55
Road costs per mbf (construction and reconstruction) to Saginaw Bay LTF	0	$31.29	$37.04	$30.93	$36.35
Issue 4 – Cumulative Watershed Effects					
Acres of extreme risk hazard (MMI 4) soils in units	0	13.7	8.3	51.8	15.9
Cumulative timber harvest acres - % of Dean Creek Watershed	31.3	31.3	31.3	34.0	34.0
Cumulative timber harvest acres - % of Saginaw Creek Watershed	8.2	9.3	12.3	13.5	12.3
Cumulative timber harvest acres - % of WS #109-45-10090	19.8	20.9	19.8	23.1	23.1
Cumulative timber harvest acres - % of WS #109-44-10370	8.2	11.0	10.7	11.4	10.9
Cumulative timber harvest acres - % of Security Creek	23.9	24.7	25.7	27.2	27.2
Cumulative timber harvest acres - % of Rowan Creek Watershed	10.6	11.1	11.2	12.2	12.4
Cumulative timber harvest acres - % of Kadake Creek Watershed	17.7	18.1	18.2	18.7	18.4

Table 2- 2 (continued). Comparison of alternatives by issue and effects

Units of Measure	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Other Environmental Considerations					
Effects on TES Species	Activities may impact individual goshawks but would not result in a trend toward listing. No effect for other species.				
Effects on Water Quality					
Number of Class I stream crossings on closed roads and proposed temporary roads	0	3	2	3	3
Number of Class II stream crossings on closed roads and proposed temporary roads	0	3	4	5	5
Number of Class III stream crossings on closed roads and proposed temporary roads	0	1	8	14	15
Number of Class IV stream crossings on closed roads and proposed temporary roads	0	5	19	19	19
Miles of temporary road construction	0	2.9	7.5	19.0	17.1
Miles of currently open roads placed in storage with structures removed and roads waterbarred	0	8.2	8.4	11.0	11.0
Effects on Wetlands					
Miles of new temporary road on wetlands	0	0.8	0.9	2.7	2.8
Effects on recreation	None				
Effects on Scenery					
Acres harvested in Recreational River LUD	0	18	0	49	0
Effects on heritage resources	None				
Effects on land status	None				

Table 2- 3. Rationale for dropping units from pool

Unit Number	Acres	Rationale for elimination from unit pool
102	62	Soil/hydrology concerns over a stream crossing by a temporary road on high MMI 4 soils. Very steep slopes
103a	90	Need stream crossing listed above
103b	26	Need stream crossing listed above
104	36	Need stream crossing listed above
106	98	Long helicopter yarding distance, not economical
107	60	Long helicopter yarding distance, not economical
108	52	Long helicopter yarding distance, not economical
109a	35	Fisheries and hydrology concerns
110	58	Fisheries and wildlife concerns
201	61	Economics, reduce temp road miles
202	24	Economics, reduce temp road miles
203	76	Economics, reduce temp road miles
206	14	Economics, reduce temp road miles
301	92	High windthrow potential and sedimentation concerns
304	81	High windthrow potential and sedimentation concerns
306	43	High windthrow potential and sedimentation concerns
406	30	MMI 4 soils, long helicopter yarding distance, economics
407	7	MMI 4 soils, long helicopter yarding distance, economics
408	63	Long helicopter yarding distance, economics
411	188	Long helicopter yarding distance, economics
413	28	Wildlife concerns
419	82	High vulnerability karst area
501a	76	Long helicopter yarding distance, economics
501b	43	Long helicopter yarding distance, economics
502	50	Long helicopter yarding distance, economics

2.8 Mitigation

The analysis documented in this EIS discloses the possible adverse effects that may occur from implementing the actions proposed under each alternative. Many of these effects are reduced or avoided by using Forest Plan direction, including management prescriptions, standards and guidelines, and Best Management Practices (BMPs), which meet the requirements of the Clean Water Act. All unit-specific and/or alternative-specific mitigation is identified in Appendix B.

The following mitigation measures would be incorporated at the implementation stages.

2.8.1 Wildlife/ Biodiversity

In all action alternatives, timber harvest would result in the loss of wildlife habitat, some of which has been identified as: (1) high value deer winter habitat, (2) coarse canopy habitat, (3) wildlife travel corridors, and/or (4) areas with evidence of comparatively high wildlife use. In some proposed harvest units, 50 percent retention of the stand's pre-harvest basal area would provide for future old-growth characteristics and stand structure and provide wildlife travel corridors. The proposed retention of all trees 16" or less DBH and western hemlock trees greater than 36" DBH in helicopter units would also help retain wildlife habitat.

2.8.2 Logging Economics

The high cost of helicopter yarding has been identified as a concern. To mitigate, or reduce, the impact to logging economics in units logged by helicopter, all tree species 16" or less DBH would be retained. Because of the high percentage of rot within large western hemlock trees, western hemlock greater than 36" DBH would be retained where it is safe to do so.

2.8.3 Cumulative Watershed Effects

After the completion of proposed harvest activities, all action alternatives would result in a net decrease in the miles of open roads in the project area by closing between 8.2 and 11 miles of road. This involves removing all culverts, excavating additional waterbars in the road surface, and allowing natural revegetation on the road and in the road ditch. This has advantages for protecting water quality and fisheries habitat by keeping road maintenance needs low, which minimizes the potential for sediment delivery to streams from the failure of drainage structures, and minimizes potential fish passage problems. Culverts associated with proposed temporary roads and those associated with roads currently in storage that would be used for this project would also be removed, restoring more natural drainage patterns and eliminating the risk of road failures at stream crossings, culvert plugging, and stream diversion. Natural revegetation would further reduce the risk of sediment delivery to streams. The removal of structures on Road 6413 and excess fill in a stream crossing on Road 6417 could restore juvenile fish passage.

2.9 Monitoring

Monitoring is a tool which involves gathering data and information and observing the results of management activities as a basis for evaluation. Monitoring activities can be divided into project-specific monitoring and Forest Plan monitoring. The National Forest Management Act requires national forests to monitor and evaluate their forest plans (36 CFR 219.110). Chapter 6 of the Forest Plan includes the activities to be conducted as part of the Forest Plan monitoring.

2.9.1 Forest Plan Monitoring

Forest Plan monitoring items are either contingent on management activities, such as those associated with this project, or are based on the condition of the Tongass National Forest as a whole. Much of the monitoring at the Forest Plan level consists of annually surveying a representative sample of harvest units or roads. Any implemented activities in the Kuiu Timber Sale Area could be incorporated as described in the *Monitoring and Evaluation Guidebook for the Tongass Land and Resource Management Plan* (USDA FS 2000).

There are three types of monitoring:

- Implementation monitoring and evaluation is used to determine if the design criteria and Forest Plan standards and guidelines are being incorporated during on-the-ground operations. This includes contract preparation and contract administration for timber harvest or road construction.
- Effectiveness monitoring is designed to determine how well specific design features used to meet Forest Plan standards and guidelines or mitigation measures work in protecting natural resources and their beneficial uses.
- Validation monitoring and evaluation is used to examine whether the assumptions and predicted effects are accurate.

2.9.2 Project-Specific Monitoring

Implementation monitoring is conducted at the project level. The selected management activities need to be consistent with the design criteria used to analyze the environmental effects during the planning stage. This ensures that the effects would not change from what was predicted. Whether or not the design criteria are effective is determined by Forest Plan level monitoring. Project activities are included as a representative sample during Forest-wide monitoring.

2.9.2.1 Implementation Monitoring

The Interdisciplinary Team prepared unit and road cards to provide site-specific analysis and guidance for unit layout, road location during timber harvest, and road construction and road reconstruction needs. Unit cards include a unit map and a narrative explaining resource

concerns and how the concerns could be addressed in the design of each unit. Road Management Objectives were developed for each classified road (Road Cards, Appendix B).

Staff who prepare timber sale contracts are required to confirm and certify that the timber sale contract is in agreement with the decision document. This certification verifies that items such as maps, number of acres, location of units, harvest methods, and stand numbers are consistent. The certification also ensures that all mitigation measures identified in the EIS relating to timber sale contract requirements are included in the timber sale contract.

Implementation monitoring continues through harvest and contract inspections. As a routine part of project implementation, sale administrators and road inspectors monitor harvest and construction activities. Through provisions contained in the timber sale contract or other contracts, contract administrators and inspectors ensure that the prescriptions contained on the unit and road cards are implemented. Sale administrators and road contract inspectors have the authority to initiate action to repair resource damage and suspend operations until problems have been corrected. This process ensures that project elements and Forest Plan standards and guidelines are implemented as designed. The Contract Administrators monitor all units and roads for implementation of the appropriate Best Management Practices.

2.9.3 Effectiveness Monitoring: Project Level

2.9.3.1 Road Condition Surveys (Fish Passage)

Objective: To ensure that all road crossings over fish streams maintain fish passage to Forest Plan standards.

Method: Fish passage will be monitored using developed criteria.

Action: If fish passage is impaired, corrective actions would be taken.

2.9.4 Validation Monitoring

2.9.4.1 Heritage Resources Predictive Model

The validation monitoring of the Heritage Resources Predictive Model is included for the Kuiu Timber Sale Area.

Objective: Validate assumptions of heritage resources predictive model.

Method: Conduct field observations along reconstructed and newly reconstructed roads.

Action: Determine if assumptions of the heritage resources predictive model require adjustment. Document results in the Tongass National Forest Annual Monitoring and Evaluation Report.

Kuiu Timber Sale
Figure 2-1
Alternative 1 No Action

Legend

- Productive Old-Growth
- Non-National Forest
- Managed Stands
- Lakes/Saltwater
- Forest Plan OGR
- Project Area Boundary
- Existing Open Roads
- Roads in Storage (Closed)
- Decommissioned Roads
- 500ft Contour Interval
- Stream Value Class I & II
- Watershed Boundary

Security Bay
Saginaw Bay
Dean Creek Watershed
Watershed 109-45-10090
Saginaw Creek Watershed
Watershed 109-44-10370
Kadake Creek Watershed
Security Creek Watershed
Rowan Creek Watershed
6448
6442
46098
6427
6425
6402
46021
6418
6413
46096
6409
46092
6415
6412
6414
46101
46420
6411
6410
46127
6417
6401
6443
6422
6444
46094
6416
6445
46154
46152
6435
46091
6429
6436
6426
6407
6408

N

0 0.25 0.5 1 1.5 2 Miles

Kuiu Timber Sale
Figure 2-2
Alternative 2

Legend

- Clearcut (0% Retention)
- 50% Retention-Clearcut with Reserves
- 50% Retention-Group Selection
- 50% Retention-Single Tree Selection
- Productive Old-Growth
- Interagency OGR
- Managed Stands
- Non-National Forest
- Lakes/Saltwater
- Roadless Areas
- Proposed Temporary Roads
- Decommissioned Roads
- Project Area Boundary
- Existing Open Roads
- Reconstructed Roads
- Roads in Storage (Closed)
- 500ft Contour Interval
- Watershed Boundary
- Stream Value Class I & II

N

0 0.25 0.5 1 1.5 2 Miles

Saginaw Bay
Security Bay
Dean Creek Watershed
Watershed 109-45-10090
Saginaw Creek Watershed
Keku Roadless Area
Watershed 109-44-10370
North Kuiu Roadless Area
Security Creek Watershed
Kadake Creek Watershed
Rowan Creek Watershed
Security Roadless Area

Kuiu Timber Sale
Figure 2-3
Alternative 3

Legend

- Clearcut (0% Retention)
- 50% Retention-Clearcut with Reserves
- 50% Retention-Single Tree Selection
- 50% Retention-Group Selection
- Productive Old-Growth
- Interagency OGR
- Non-National Forest
- Managed Stands
- Lakes/Saltwater
- Roadless Areas
- Project Area Boundary
- Existing Open Roads
- Proposed Temporary Roads
- Roads in Storage (Closed)
- Decommissioned Roads
- Reconstructed Roads
- 500ft Contour Interval
- Stream Value Class I & II
- Watershed Boundary

N

0 0.25 0.5 1 1.5 2 Miles

Saginaw Bay
Security Bay
Dean Creek Watershed
Saginaw Creek Watershed
Watershed 109-45-10090
Keku Roadless Area
Watershed 109-44-10370
Kadake Creek Watershed
North Kuiu Roadless Area
Security Creek Watershed
Rowan Creek Watershed
Security Roadless Area

Kuiu Timber Sale
Figure 2-4
Alternative 4

Legend

- Clearcut (0% Retention)
- 50% Retention-Clearcut with Reserves
- 50% Retention-Group Selection
- 50% Retention-Single Tree Selection
- Productive Old-Growth
- Interagency OGR
- Non-National Forest
- Managed Stands
- Lakes/Saltwater
- Roadless Areas
- Helicopter Yarding
- Reconstructed Roads
- Project Area Boundary
- Existing Open Roads
- Roads in Storage (Closed)
- Decommissioned Roads
- 500ft Contour Interval
- Stream Value Class I & II
- Watershed Boundary
- Proposed Temporary Roads

N

0 0.25 0.5 1 1.5 2 Miles

Kuiu Timber Sale
Figure 2-5
Alternative 5

Legend

- Clearcut (0% Retention)
- Productive Old-Growth
- Interagency OGR
- Managed Stands
- Non-National Forest
- Lakes/Saltwater
- Roadless Areas
- Project Area Boundary
- Reconstructed Roads
- Existing Open Roads
- Roads in Storage (Closed)
- Decommissioned Roads
- 500ft Contour Interval
- Stream Value Class I & II
- Proposed Temporary Roads
- Watershed Boundary

N

0 0.25 0.5 1 1.5 2 Miles

Saginaw Bay
Security Bay
Dean Creek Watershed
Watershed 109-45-10090
Saginaw Creek Watershed
Keku Roadless Area
Watershed 109-44-10370
North Kuiu Roadless Area
Kadake Creek Watershed
Security Creek Watershed
Security Roadless Area
Rowan Creek Watershed

Chapter 3
Affected Environment and Environmental Consequences

Chapter 3
Table of Contents

Chapter 3
Affected Environment and Environmental Consequences

3.1 Introduction

This chapter provides information concerning the existing environment of the Kuiu Timber Sale Area, and potential consequences to that environment as a result of this project. It also presents the scientific and analytical basis for the comparison of alternatives presented in Chapter 2. Each resource potentially affected by the Proposed Action or other alternatives is described by its current condition and uses. Some other findings required by policy and law are included at the end of the chapter.

The chapter begins with a description of the environmental effects on resources associated with the four significant issues in the Kuiu Timber Sale Area. Other concerns raised during scoping that are not significant issues are discussed in the Other Environmental Considerations section. These include potential effects (environmental consequences) that are mitigated in the same way in all alternatives, or resources that are not significantly affected by any alternative. All effects, including direct, indirect, and cumulative effects, are disclosed. Effects are quantified where possible, and qualitative discussions are also included. The means by which potential adverse effects would be reduced or mitigated are described (Chapter 2 and Appendices B and C).

The discussions of resources and potential effects use existing information included in the Forest Plan, other project environmental analyses, project-specific resource reports, agency and scientific studies, and related information. Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record for the Kuiu Timber Sale Area includes all project-specific information, including resource reports, documentation of field investigations, and information resulting from public involvement efforts. The planning record is located at the Petersburg Ranger District Office in Petersburg, Alaska, and is available for review

during regular business hours. Information from the record is available upon request.

3.1.1 Administrative and Ecological Land Divisions

The land area of the Tongass National Forest has been divided in several different ways to describe the different resources and facilitate systematic and consistent analysis. These divisions vary by resource as the relationship of each resource to geographic conditions and zones varies.

3.1.1.1 Land Use Designations (LUDs)

The allocation of land use designations (LUDs), as discussed in Chapter 1, was accomplished with the Forest Plan. Each LUD provides for a combination of activities, goals and objectives, and uses. There are three LUDs within the Kuiu Timber Sale Area. These are: Timber Production, Recreational River, and Old-growth Habitat. The standards and guidelines for these LUDs were used for unit design and to analyze effects on scenery. The LUDs within the Kuiu Timber Sale Area are discussed and displayed in Chapter 1.

3.1.1.2 Value Comparison Units (VCUs)

For the purposes of project-level analysis, the Tongass National Forest is divided into Value Comparison Units (VCUs). These are distinct geographic areas, each encompassing a drainage basin containing one or more large stream systems. The boundaries usually follow major watersheds. The Kuiu Timber Sale Area includes lands within VCUs 399, 400, 402 and 421 on the northern portion of Kuiu Island. VCUs are used to analyze the size of small old-growth habitat reserves.

3.1.1.3 Wildlife Analysis Areas (WAAs)

Wildlife Analysis Areas (WAAs) are land divisions used by the Alaska Department of Fish and Game to report community harvests of selected wildlife species. The project area lies within WAA 5012 and makes up approximately 32 percent of the WAA. Some of the wildlife and subsistence analyses for the Kuiu Timber Sale Area are compiled by WAA.

3.1.1.4 Ecological Subsections

The term "ecological subsection" refers to mapping delineations described in *Ecological Subsections of Southeast Alaska and Neighboring Areas of Canada* (Nowacki et al. 2001). This system is part of a national hierarchical framework designed to group ecosystems into logical associations. The Kuiu Timber Sale Area is within the Rowan Sediments and North Prince of Wales-Kuiu Carbonates ecological subsections.

3.1.2 Analyzing Effects

Environmental consequences are the effects of implementing an alternative on the physical, biological, social, and economic environment. The Council on Environmental Quality (CEQ)

regulations implementing the National Environmental Policy Act (NEPA) includes a number of specific categories for the analysis of environmental consequences. Several are applicable to the analysis of the proposed project and alternatives and form the basis of much of the analysis which follows. They are explained briefly here.

3.1.2.1 Direct, Indirect, and Cumulative Effects

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity, but could have some effect in the foreseeable future. Cumulative effects result from incremental effects of actions when added to other past, present, and reasonably foreseeable future actions, regardless of which agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

3.1.2.2 Unavoidable Adverse Effects

Implementation of any action alternative may cause some adverse environmental effects that cannot be effectively mitigated or avoided. Unavoidable adverse effects often result from managing the land for one resource at the expense of other resources. Many adverse effects can be reduced, mitigated, or avoided by limiting their extent or duration. The interdisciplinary procedure used to identify specific harvest units and roads was designed to eliminate or lessen the significant adverse consequences. The application of Forest Plan standards and guidelines, Best Management Practices (BMPs), project-specific mitigation measures, and monitoring are all intended to further limit the extent, severity, and duration of potential effects. The purpose of this chapter is to discuss such measures and fully disclose any adverse effects.

3.1.2.3 Short-term Use and Long-term Productivity

Short-term uses and their effects are those that occur annually or within the first few years of project implementation. Long-term productivity refers to the capability of the land and resources to continue producing goods and services long after the project has been implemented. Under the Multiple-Use Sustained Yield Act (MUSYA), and the National Forest Management Act (NFMA), all renewable resources are to be managed in such a way that they are available for future generations. Timber harvest can be considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished if the long-term productivity of the land is maintained. This long-term productivity is maintained through the application of the resource protection measures described in Chapter 2, in particular those applying to the soil and water resources. These protection

measures are also discussed throughout this chapter, in particular for soils, water quality, biodiversity, and economics.

3.1.2.4 Irreversible and Irretrievable Commitments

Irreversible commitments are decisions affecting non-renewable resources such as soils, wetlands, unroaded areas, and heritage resources. Such commitments are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a geological period of time, at a great expense, or not at all. The destruction of an archaeological site is an example of an irreversible commitment. No irreversible effects are expected to occur within this project.

Irretrievable commitments represent opportunities foregone for the period during which resource use or production cannot be realized. Such decisions are reversible, but the production opportunities foregone are irretrievable. For example, the construction of a classified road for long-term management is an irretrievable action. The commitment is irretrievable rather than irreversible, because trees could be reestablished in this area, but the amount of timber production during the period of time when the land was used as a road could not be regained. Expansion of existing rock sources would lead to an irretrievable commitment of resources within this project.

3.1.3 Resource Information on the Geographic Information System

Much of the Tongass National Forest resource data resides in an electronic database formatted for a geographic information system (GIS). The Forest uses GIS software to assist in the analyses of these data. GIS data is available in tabular (numerical) format, and as plots displaying data in map format. For this EIS, all the maps and most of the numerical analyses are based on GIS resource data supported by field verification.

GIS data does have some limitations. This is especially true when comparing the data layers used for the Forest Plan with the project-specific data layers. The Forest Plan uses point data for analyses because the area to be analyzed covers a large area (17 million acres). Each point represents approximately 20.66 acres.

For smaller areas of land, polygon layers can be used. Project-level analysis done for environmental documents usually uses polygon data. These GIS layers have polygons of varying sizes. GIS data, which was often obtained by aerial photo interpretation, has been updated using data collected during field reviews. Areas that project activities may affect were field inventoried. Project-level layers will continue to be updated and added to the GIS layers as more information becomes available through implementation activities or other surveys.

3.1.4 Available Resource Information

There is incomplete knowledge about many of the conditions and relationships of forest resources and social needs. Forest management is a complex and developing science. Wildlife population dynamics and habitat relationships are not completely understood. The interaction of forest resource supply with economic and social conditions and communities is the subject matter of an inexact science. However, the basic data and central relationships are sufficiently well established in the respective sciences for the analysis of the Kuiu Timber Sale Area for the Responsible Official to make a reasoned choice between the alternatives, and to adequately assess and disclose the possible adverse environmental consequences.

3.1.5 Discussion of Significant Issues

A significant issue provides the focus for one or more alternatives and can be used to compare alternatives. It is used to track environmental effects throughout the analysis. Significant issues for the Kuiu Timber Sale were identified through public and internal scoping. Chapter 1 describes the process used to identify issues. Similar issues were combined where appropriate.

Once a significant issue is identified, measures are identified to analyze how each alternative responds to the concern. Measures are chosen that are quantitative (where possible), predictable, responsive to the issue, and linked to cause-and-effect relationships. These measures describe how the alternative affects the resource or resources at the heart of the issue.

The issues that were determined to be significant and within the scope of the project decision are: 1) Roadless Areas, 2) Wildlife Habitat and Subsistence Use, 3) Timber Sale Economics, and 4) Cumulative Effects on Watersheds.

3.2 Issue 1 – Roadless Areas

3.2.1 Introduction

Roadless areas were originally identified during the Roadless Area Review and Evaluation studies (RARE I and RARE II) done in the 1970s. Roadless areas are defined as undeveloped lands where there are no roads maintained for travel by motorized vehicles intended for highway use and that do not have extensive timber harvest or other developments.

Roadless areas and their values are issues of national importance. On the Tongass National Forest, many of the biological and social values of roadless areas were taken into consideration when determining the land use designations for the Forest Plan. The Kuiu Timber Sale Area includes portions of two roadless area; North Kuiu Roadless Area and Security Roadless Area.

3.2.2 Background

Several terms are used when referring to roadless areas on National Forests and are important to this analysis.

Roadless Areas refer to undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for wilderness consideration under the Wilderness Act. Areas meeting these criteria were inventoried during the Forest Service's RARE II process, subsequent assessments, or forest planning. The inventory conducted by the Tongass National Forest and published in the Tongass Forest Plan Supplemental Environmental Impact Statement 2003, (Forest Plan SEIS) represents the best and most recent inventory on the Tongass.

Unroaded Areas refer to undeveloped areas with typically fewer than 5,000 acres, but of a size and configuration sufficient to protect the inherent characteristics associated with their roadless condition. Unroaded areas do not overlap with "roadless areas."

3.2.2.1 Roadless Analysis in the Forest Plan

During the revision of the Forest Plan, all areas, including roaded and roadless areas, were analyzed. The Forest Plan allocated some portions of the roadless areas to Timber Production, Modified Landscape, and Scenic Viewshed Land Use Designations (LUDs), all of which allow roading and timber harvest. Other portions of roadless areas are allocated to non-development LUDs. These allocations include Old-growth Habitat, Remote Recreation, Semi-remote Recreation, Special Interest Areas, and Recreational River LUDs. About 74 percent of the Roadless Areas in the Tongass National Forest are included in non-development LUDs.

3.2.2.2 Roadless Area Conservation Rule

Effective May 13, 2005, The Department of Agriculture revised the 2001 Roadless Area Conservation Rule (Subpart B of Title 36, Code

of Federal Regulations, Protection of Roadless Areas) by adopting a new rule - Special Areas; State Petitions for Roadless Area Management. This 2005 Roadless Rule establishes a petitioning process that provides Governors an opportunity to seek establishment of or adjustment to management requirements for National Forest System roadless areas within their States. Submission of a petition is strictly voluntary, and management requirements for roadless areas are guided by the Tongass Forest Plan until and unless these management requirements are changed through a State-specific rulemaking. If the Secretary of Agriculture accepts a petition, the Forest Service shall be directed to initiate notice and comment rulemaking to address the petition. Further details on the history of the Roadless Rule and how it affected development of this project are available in the project record.

In December 2003, as part of a settlement agreement reached in the *State of Alaska v. USDA,* the Department adopted a final rule that temporarily withdrew the Tongass National Forest from the provisions of the 2001 Roadless Rule. Under the approach established in the 2005 final rule, management of roadless areas on the Tongass will continue to be governed by the existing Forest Plan, unless changed through a State-specific rulemaking as described above. The 2005 rule negates the need for further Tongass-specific rulemaking anticipated in the 2003 temporary withdrawal.

3.2.3 Current Condition

3.2.3.1 Introduction

Most of Southeast Alaska is currently unroaded. About 74 percent of the roadless areas are within land use designations that would retain their unroaded condition through the life of the Forest Plan (Forest Plan SEIS Record of Decision (ROD) p. 12). There are eight Roadless Areas on Kuiu Island. Table 3-1 lists the size of each roadless area along with acres in Development and Non-development LUDs.

The Forest Plan 2003 inventory identified two roadless areas that overlap the Kuiu Timber Sale Area (North Kuiu #241 and Security #240). Another roadless area occurs near the Kuiu Timber Sale Area - Keku (#239), which is 11,170 acres in size. This area occurs to the east of the project area. The integrity of the Keku Roadless Area would not be affected by any of the proposed activities. Figure 3-1 shows the location of the roadless areas on the northern portion of Kuiu Island. The proposed action alternatives would not make any roadless areas ineligible for wilderness designation although the size of one roadless area may be reduced, as described later in this analysis.

Table 3 - 1. Kuiu Island roadless areas

Roadless area	Roadless area number	Non-development acres[a]	Development acres	Total acres in roadless area
Keku	239	3,062	8,108	11,170
Security	240	26,104	9,393	35,497
North Kuiu	241	734	8,810	9,544
Camden	242	8,095	32,300	40,395
Rocky Pass[b]	243	73,961	5,142	79,103
Bay of Pillars	244	27,782	946	28,728
East Kuiu[c]	245	16,711	29,684	46,395
South Kuiu	246	63,063	0	63,063
Total Acres		**219,512**	**94,383**	**313,895**

[a] Forest Plan allocation

[b] Includes acres on both Kuiu Island and Kupreanof Island

[c] Includes some small islands off the coast of Kuiu Island

3.2.3.2 Roadless Areas

Portions of two roadless areas and three smaller unroaded areas lie within the Kuiu Timber Sale Area (Table 3-2 and Figure 3-2). The roadless areas are: North Kuiu Roadless Area (#241) and Security Roadless Area (#240). These roadless areas lie near the existing road system. Although infrequent, sights and sounds of vehicles traveling this existing road system may occur. These noises are temporary and of short duration.

Table 3 - 2. Acres of roadless areas within the Kuiu Timber Sale Area

Roadless area	Total roadless area (acres)	Roadless area acres within project area
North Kuiu (#241)	9,544 acres	9,544 acres
Security (#240)	35,497 acres	134 acres

3.2.3.3 Security Roadless Area #240

The Security Roadless Area is located on the northwest side of Kuiu Island, approximately 15 air miles southwest of Kake and about 50 air miles west of Petersburg. Chatham Strait lies to the west, Security Bay to the northeast, and Frederick Sound to the north.

Approximately 134 acres of the Security Roadless Area are within the project area. No activities are proposed within this roadless area; therefore, this roadless area will not be discussed further in this EIS. Additional information on the Security Roadless Area is available in the Roadless Area Analysis located in the project planning record.

3.2.3.4 North Kuiu Roadless Area #241

The North Kuiu Roadless Area is located near the center of the northern portion of Kuiu Island. Roads surround the area and provide access to Rowan Bay (Figure 3-1). Petersburg is approximately 40 air miles from the roadless area. Kake, the nearest town, is located approximately 10 air miles away on Kupreanof Island.

The following discussion relates to the Forest Plan SEIS. The values discussed below have been identified as key characteristics of roadless areas in the National Forest System. This discussion evaluates the North Kuiu Roadless Area using these national criteria.

Wilderness Potential

The North Kuiu Roadless Area is unmodified; however, its overall appearance is affected by its irregular shape and the patterns of development surrounding the area, such as adjacent timber harvest and roads.

There are no special attractions or features in this roadless area and no known significant or unique features or values.

Opportunity for Solitude and Serenity

The opportunity for solitude is low and the opportunity for primitive recreation is moderate in this roadless area. Vehicle traffic occasionally passes nearby and may be heard and seen from within the roadless area. Most of the roadless area is within one mile of a road.

Scenic Values

The area is unmodified; however, its overall integrity is not pristine. The irregular shape of the area, patterns of adjacent timber management and roading have affected the natural appearance of the landscape. The roadless area contains no landscapes considered distinctive for the character type from a scenery perspective.

Fisheries

The roadless area contains primarily Class III headwater streams (see the Fisheries section in this chapter for stream class definitions). Pink and chum salmon spawning habitat is limited to the lower portions of the watershed where a lower-gradient floodplain channel is present. A population of deer and black bear range over the area, as do some moose.

Vegetation

All of the North Kuiu Roadless Area lies within the boundary of the Kuiu Timber Sale Area. There are 9,456 acres of mapped forest lands in the roadless area, approximately 90 percent of which is productive old-growth. Of the productive old-growth acres, approximately 5,932 acres, or 63 percent, are mapped as high-volume old-growth forest. The productive old-growth includes about 3,408 acres of high-volume, coarse-canopy old-growth. There is no mapped second growth due for harvest (Forest Plan SEIS p. 241).

Management Direction and Current uses

The majority of this roadless area, 92 percent, was allocated to the Timber Production LUD. Approximately eight percent of the roadless area was allocated to non-development LUDs (Table 3-3).

There are no developed recreation sites in the roadless area. Deer hunting is the primary recreational use. There is some subsistence use in the area; most use is concentrated along the road-accessible areas outside of the roadless area.

Table 3 - 3. North Kuiu Roadless Area LUDs

LUD	Acres of LUD in roadless area	Percent roadless area
Timber Production	8,810 acres	92%
Old-growth Habitat Reserve	385 acres	4%
Recreational River	349 acres	4%
Total	9,544 acres	100%

Recreational Values

Tourism has been increasing in Southeast Alaska and is expected to continue increasing. North Kuiu Roadless Area is relatively close to Kake, which has Alaska Marine Highway ferry service. A very small portion of Kadake Creek, a Recreational River, lies in the northeast portion of the North Kuiu Roadless Area. There is little potential for outfitter and guide permits given the difficulty in accessing the area and the habitat conditions.

There are no recreation places in the North Kuiu Roadless Area.

Biological Values

The vegetation within the North Kuiu Roadless Area is typical of Southeast Alaska. Most of the area is covered with a mosaic pattern of temperate rainforest and muskeg (see the Timber and Vegetation, and Soils sections in this chapter).

Roadless areas have value as habitat for wildlife species with large home ranges such as wolf or black bear. The home range of a typical wolf pack is about 50,000 acres. The roadless areas, in conjunction with the rest of Kuiu Island, provide habitat for wolves and bear (see the Issue 2 – Wildlife Habitat and Subsistence Use in this chapter).

The only federally listed threatened or endangered species likely to occur within or adjacent to the roadless areas are the humpback whale (endangered) and the Steller's sea lion (threatened). Both of these species are found in adjacent marine waters. Three Forest Service Region 10 Sensitive Species are suspected or known to occur within the area; trumpeter swan, Peale's peregrine falcon, and the Queen Charlotte goshawk. Trumpeter swans nest in the lowlands on small lakes and along large rivers and winter in ice-free areas throughout the Tongass. Peale's peregrine falcons nest on cliff faces and islands and feed primarily on seabirds. Queen Charlotte goshawks are closely associated with productive old-growth.

Twelve sensitive plant species are known or suspected to occur in the Petersburg Ranger District. Botanical surveys were conducted in representative habitats within and around the project area and no threatened or endangered plant species were located. Two sensitive plant species are known to occur on Kuiu Island (*Poa laxiflora* and *Glyceria leptostostachya*). *Poa laxiflora* is known to occur within the project area (see the Threatened, Endangered, and Sensitive Species section this chapter).

Cultural or Historical Values

The North Kuiu Roadless Area lies within the traditional territory of the Kake Tlingit. There are no known cultural resource sites in the roadless area, although some subsistence use probably occurs in the area via access by existing roads that surround the project area.

More recent history includes black bear and deer hunting, and timber sales in the adjacent roaded areas.

Research Values

The area contains no known features of special interest other than two bands of karst. The mapped karst resources encompass approximately 2,270 acres or 24 percent of the roadless area. The area does not include any Potential Research Natural Areas and has not been identified for any other scientific purpose.

3.2.3.5 Unroaded Areas

In addition to analyzing roadless areas, the Forest Plan SEIS also identified unroaded areas with fewer than 5,000 acres. These unroaded areas are divided into two categories: areas greater than 1,000 acres but less than 5,000 acres in size and areas less than 1,000 acres in size.

The Kuiu Timber Sale Area has three unroaded areas between 1,000 acres and 5,000 acres in size (Figure 3-1).

- Unroaded area 1 is 2,412 acres in size and is located in the southern portion of the project area. It is surrounded on all sides by previously harvested units and logging roads. There are no managed stands within this area.
- Unroaded area 2 is 3,302 acres in size and is located in the northeastern portion of the project area. It is bounded on one side by the ocean and on the other three sides by logging roads and previously harvested units. There are no managed stands within this area.
- Unroaded area 3 is 3,009 acres in size and is located in the northernmost tip of the project area. This area is a rough half circle with the rounded portion bounded by ocean and the other edge bounded by logging roads. Approximately 88 acres were harvested between 1985 and 1999.

There are no proposed timber harvest units or roads in any of the unroaded areas less than 1,000 acres in size within the project area; therefore, these areas will not be analyzed further in this EIS.

3.2.4 Effects on the North Kuiu Roadless Area

3.2.4.1 Introduction

The Forest Plan SEIS GIS layer reflects the best and most current information on roadless areas on the Tongass and was used for summarizing the information required for the following analyses.

This section describes the effects of the project on roadless areas in terms of the amount of road to be constructed and the amount of timber harvest proposed within the boundaries by alternative. Additionally, any change in the size of North Kuiu Roadless Area is determined for each alternative. The inventory criteria used for this project is the same used to delineate roadless areas in the Forest Plan and the Forest Plan SEIS. Existing roads and harvest units, and all areas within 1,200 feet of an existing road and 600 feet of an existing harvest unit, are considered developed for the purposes of this analysis. These 1,200 and 600-foot buffers are considered "zones of influence" affected by their proximity to roads, harvest units, and other development or activities. Small included areas and long narrow strips of unroaded areas are also considered developed and are not included in the roadless area acres.

Some of the timber harvest units are proposed for partial harvest, which produces fewer effects than clearcutting. Helicopter logging further reduces effects because it does not require as much road building, thereby limiting access to the roadless area.

Table 3-4 displays the effects of the proposed activities on the North Kuiu Roadless Area. A narrative review of the effects follows the table.

3.2.4.2 Effects Common to all Alternatives

In all alternatives, the North Kuiu Roadless Area would remain greater than 5,000 acres in size and would remain eligible for wilderness designation.

Logging activities and traffic may be heard from the existing logging roads surrounding the North Kuiu Roadless Area and from the eastern boundary of the Security Roadless Area. These logging roads were present when roadless areas were analyzed for the Forest Plan Final EIS. The proposed activities would not change the integrity of the roadless areas.

Because the area is currently influenced by roads and managed stands, the effect on the edge of the roadless area from the action alternatives to the overall roadless area characteristics and values would be minimal. Values of the roadless area would remain unchanged, with opportunities for solitude remaining low and the opportunity for primitive recreation moderate. In addition, the roadless area includes no landscapes considered distinctive for the character type from a scenery perspective.

Table 3 - 4. E. ts on the North Kuiu Roadless Area[a] by alternative

Measure of Effect	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Harvest unit acres in roadless area	0	0	67	210	114
Acres of roadless area affected[b]	0	0	258	663	404
Percent of roadless area affected	0	0	3%	7%	4%
Miles of temporary roads in roadless area (all would be closed after harvest)	0	0	0.2	0.95	0.95
North Kuiu Roadless Area acres after harvest[b]	9,544	9,544	9,286	8,881	9,140

[a] This table uses the Forest Plan SEIS Roadless acres
[b] Total includes 600-foot buffers around proposed timber harvest units and 1,200-foot buffers along proposed temporary roads within the roadless areas

3.2.4.3 Comparison of Alternatives

Alternatives 1 and 2 would not affect the North Kuiu Roadless Area. These alternatives do not propose any timber harvest units or roads within the roadless area, nor would the zones of influence from roads or timber harvest extend into the roadless area. The roadless area would remain unchanged under Alternatives 1 and 2.

Alternatives 3, 4, and 5 include portions of timber harvest u. .ts within the boundary of the North Kuiu Roadless Area. Additional units would be located within 600 feet of the roadless area; therefore, their zones of influence would extend into the edge of the roadless area. This would reduce the overall size of the roadless area by a maximum of 663 acres (Alternative 4).

Of the four action alternatives, Alternative 4 would have the greatest direct effect on the North Kuiu Roadless Area, with up to 210 acres harvested from eight units within the roadless area and two units whose zones of influence would extend into the roadless area. In addition, 0.95 mile of temporary road is proposed within this roadless area. The affected acres represent about seven percent of the North Kuiu Roadless Area.

Kuiu Timber Sale

Figure 3-1
Roadless Areas and
Unroaded Areas

Legend

- Roadless Areas
- Unroaded Areas > 1000 Acres and < 5000 Acres
- Unroaded Areas < 1000 Acres
- Unit Pool
- Non-National Forest
- Managed Stands
- Lakes/Saltwater
- Project Area Boundary
- Existing Open Roads
- Stream Value Class I & II

Keku Strait
Saginaw Bay
Security Bay
Kadake Bay
Keku Roadless Area
North Kuiu Roadless Area
Camden Roadless Area
Security Roadless Area
2
3
1
504
503
103d
103c
112
101
302
303
205
207
204
208b
208a
208
209
305
307
211
210
212
109b
308
111
401
402
405
414
416
415
404
409
410
418
417
412
N
0 0.5 1 2 3 4 Miles

3.2.4.4 Alternative 1

This alternative does not propose road construction or timber harvest nor does it propose to reduce the miles of open drivable roads. Where a minimum of 8.2 miles of road is proposed for closure in all action alternatives, in Alternative 1 those roads would remain open and would continue to influence the quality of the roadless area through the sights and sounds of vehicle traffic at current levels.

3.2.4.5 Alternative 2

Direct Effects

There would be no direct effects on the North Kuiu Roadless Area in Alternative 2. This alternative does not propose any timber harvest or road construction in the North Kuiu Roadless Area. None of the zones of influence from roads or timber harvest would extend into the roadless area.

Indirect Effects

Indirect beneficial effects could occur through the closure of 8.2 miles of roads that are currently open. Closure of these roads could reduce the influence of sights and sounds from vehicle use within the roadless area. However, this influence is small, as these remote roads are not used much beyond logging and hunting and would not change the overall integrity of the roadless area.

3.2.4.6 Alternative 3

Direct Effects

Harvest of 67 acres of timber and construction of 0.2 mile of temporary road is proposed within the North Kuiu Roadless Area in Alternative 3. A total of 258 acres in the roadless area would be affected, including the 600-foot zone of influence around harvest units and the 1,200-foot zone of influence around proposed roads.

The reduction of 258 acres (three percent of the roadless area) is not expected to change the integrity of the North Kuiu Roadless Area. Portions of Units 109, 210, and 308 would be within the roadless area. Unit 307 would be within 600 feet of the roadless area, and its zone of influence would extend into the edge of the area.

All effects would occur along the edge of the roadless area. With the ongoing influence from roads and managed stands, the effects to the overall roadless area characteristics and values would be minimal. About 9,286 acres would be maintained in a roadless condition. Opportunities for solitude would remain low, and the opportunity for primitive recreation would remain moderate.

Indirect Effects

Indirect beneficial effects could occur through the closure of 8.4 miles of roads that are currently open. Closure of these roads could reduce the influence of sights and sounds from vehicle use. However, this influence is small, as these remote roads are not used much beyond logging and hunting and would not change the overall integrity of the roadless area.

3.2.4.7 Alternative 4

Direct Effects

This alternative proposes harvest of 210 acres of timber and construction of 0.95 mile of temporary roads within the North Kuiu Roadless Area. A total of 663 acres in the roadless area would be affected when the 600-foot zone of influence around harvest units and the 1,200-foot zone of influence around roads are applied around the proposed activities.

The reduction of 663 acres (seven percent of the roadless area) is not expected to change the integrity of the North Kuiu Roadless Area. Portions of Units 101, 109, 210, 211, and 308 would be located within the edges of the roadless area. Helicopter Units 305, 302, and 303 are located almost entirely within the roadless boundary. Units 212 and 307 would be within 600 feet of the roadless area, extending their zones of influence into the edge of the roadless area.

All effects would occur along the edge of the roadless area. With the ongoing influence from roads and managed stands, the effects to the overall roadless area characteristics and values would be minimal. While this alternative would result in the greatest reduction in overall roadless area acres, these acres would still be removed from the edges of the roadless area and would not affect the overall values of the area. The opportunity for solitude would remain low, and the opportunity for primitive recreation would remain moderate. About 8,881 acres would be maintained in a roadless condition.

Indirect Effects

Beneficial effects could result from the closure of 11 miles of roads that are currently open around the roadless area. Closure of these roads could reduce the influence from sights and sounds of vehicle use. However, this influence is small, as these remote roads are not used much beyond logging and hunting and would not change the overall integrity of the roadless area.

3.2.4.8 Alternative 5

Direct Effects

This alternative proposes harvest of 114 acres of timber and construction of 0.95 mile of temporary roads within the North Kuiu Roadless Area. A total of 404 acres of roadless area would be affected when the 600-foot zone of influence around harvest units and the 1,200-foot zone of influence around roads are applied around the proposed activities.

The reduction of 404 acres (four percent of the roadless area) is not expected to change the integrity of the North Kuiu Roadless Area. Units 101, 109, 210, 211, and 308 would be located within the roadless area. Units 212 and 307 would be within 600 feet of the roadless area, extending their zones of influence into the edge of the roadless area.

All effects would occur along the edge of the roadless area. With the ongoing influence from roads and managed stands, the effects to the overall roadless area characteristics and values would be minimal. About 9,140 acres would be maintained in a roadless condition. Opportunities for solitude would remain low, and the opportunity for primitive recreation moderate.

Indirect Effects

Beneficial effects could result from the closure of 11 miles of roads that are currently open around the roadless area. Closure of these roads could reduce the influence from sights and sounds of vehicle use. However, this influence is small, as these remote roads are not used much beyond logging and hunting and would not change the overall integrity of the roadless area.

3.2.5 Effects on Unroaded Areas

Table 3-5 and Table 3-6 list the effects of the proposed harvest by alternative on the two unroaded areas in which timber harvest or temporary road building are proposed. No table is shown for the third unroaded area, in which no timber harvest or road construction is proposed in any action alternative. Locations of these unroaded areas are shown in Figure 3-1.

Table 3 - 5. Effects on Area 1 (southern unroaded area 2,412 acres) by alternative

Measure of Effects	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Acres harvested within units	0	0	68	149	149
Acres of unroaded area affected[a]	0	0	289	428	428
Percent of unroaded area affected by units	0	0	3%	8%	8%
Miles of temporary roads in unroaded areas and in 1,200 foot buffer[b]	0	0	0.64	0.64	0.64
Unroaded Area 1 acres after harvest[a]	2,412	2,412	2,123	1,984	1,984

[a] Total includes 600-foot buffers around proposed timber harvest units and 1,200- foot buffers along proposed temporary roads within the roadless areas.
[b] All new roads in roadless areas would be closed after harvest

Table 3 - 6. Effects on Area 2 (middle unroaded 3,302 acres) by alternative

Measure of Effect	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Acres harvested within units	0	0	0	18	18
Acres of unroaded area affected[a]	0	0	0	112	112
Percent of unroaded area affected by units	0	0	0	3%	3%
Miles of temporary roads in unroaded areas[b]	0	0	0	0.1	0.1
Unroaded Area 2 acres after harvest[a]	3,302	3,302	3,302	3,190	3,190

[a] Total includes 600-foot buffers around proposed timber harvest units and 1,200-foot buffers along proposed temporary roads within the roadless areas.
[b] All new temporary roads in roadless areas would be closed after harvest

3.2.5.1 Direct Effects

Alternatives 1 and 2 would not affect unroaded areas less than 5,000 acres. These alternatives do not propose any timber harvest units or roads within unroaded areas, nor would the zones of influence from roads or timber harvest extend into any unroaded area.

Alternative 3 proposes harvest of 68 acres (portions of Units 403, 409, and 410), and construction of 0.64 mile of temporary road within Unroaded Area 1. This area would be reduced by approximately three percent to 2,123 acres. No timber harvest is proposed within Unroaded Area 2 in Alternative 3.

Alternatives 4 and 5 propose harvest of 167 acres from Unroaded Areas 1 and 2 (Units 402, 403, 409, 410, 412, and 503) and construction of 0.65 mile of temporary road within the unroaded areas. A total of 540 acres of unroaded area would be affected when the zones of influence from roads and timber harvest is considered. Unroaded Area 1 would be reduced by approximately eight percent to 1,984 acres and Unroaded Area 2 would be reduced approximately three percent to 3,190 acres in Alternatives 4 and 5.

3.2.5.2 Indirect Effects

Logging activities and traffic may be heard from Unroaded Area 1. These logging roads existed before this project was planned. The proposed activities would not change the integrity of the unroaded areas.

3.2.6 Conclusion

In Alternatives 1 and 2 the roadless areas and unroaded areas would be unchanged. In Alternatives 3-5, the North Kuiu Roadless Area and two of the three unroaded areas would be reduced in size as shown in Table 3-4, Table 3-5, and Table 3-6. The roadless areas would remain eligible for inclusion in the National Wilderness Preservation System. Values identified for the roadless areas within the Kuiu Timber Sale Area would be retained.

3.2.6.1 Cumulative Effects

Cumulative effects on roadless areas were analyzed at the Forest Plan level. The decision was made to allocate roadless areas to either development or non-development land use designations. During the analysis for the Forest Plan, the values of the roadless areas, their location, and their proximity to other roadless areas, especially Congressionally-designated Wilderness Areas, were used to determine which roadless areas would be allocated for development.

There are 5.8 million acres of Congressionally-designated Wilderness within the Tongass National Forest. These areas will remain as Wilderness in perpetuity. Of the other 9.6 million acres of land that are currently unroaded, even with full implementation of activities allowed by the Forest Plan and no further wilderness designation, 90 percent would remain roadless after 10 years, and 87 percent would remain roadless after 50 years (2003 Forest Plan SEIS ROD p. 12). None of the alternatives for the Kuiu Timber Sale project would affect the wilderness eligibility of any roadless area.

In the Kuiu Timber Sale action alternatives, individual timber sales are planned to be offered in 2006. Road construction and harvest of an action alternative would be completed approximately three to four years later.

It is reasonable to assume that timber harvest and associated road management will continue on Kuiu Island. The current 5-year timber sale schedule lists two additional sales:

- Threemile Timber Sale FEIS was signed April 2004 and offers 19.5 mmbf. This project does not enter the roadless areas included in the Kuiu Timber Sale. The Threemile Timber Sale will harvest approximately 19.5 mmbf on approximately 665 acres and construct 4.2 miles of new classified roads and 4.2 miles of temporary roads. Nine harvest units totaling 621 acres are within three Roadless Areas; Camden, Rocky Pass and East Kuiu. The Threemile timber sale project would not affect the wilderness eligibility of any of these roadless areas.
- Bayport is a 10 mmbf timber sale scheduled for planning to begin in 2009. This project includes Camden Roadless Area and three unroaded areas less than 5,000 acres but greater than 1,000 acres.

Units within the Rowan Mountain Sale would reduce acres within the North Kuiu Roadless Area. The roadless area would still be eligible for Wilderness designation.

The current five-year plan is not expected to reduce the size of any of the roadless areas on Kuiu Island to less than 5,000 acres or remove them from eligibility for wilderness consideration.

Since timber harvest and associated road building and major facilities are not allowed within non-development LUDs, at least 219,512 acres of these roadless areas would remain in a natural state for the life of the Forest Plan.

3.3 Issue 2 – Wildlife Habitat and Subsistence Use

3.3.1 Introduction

This issue relates to changes in wildlife habitat including wildlife travel corridors, critical winter range, and the effect of road densities to wildlife and the availability of various species, particularly deer, for subsistence hunting on Kuiu Island in general and within the project area specifically.

The Forest Plan conservation biology strategy includes a forest-wide network of large, medium, and small old-growth habitat reserves (OGRs). Both the location and habitat of the small old-growth habitat reserves and the connectivity, location, and habitat quality of the corridors linking these reserves are important components of the strategy.

The reduction of high value winter range (high volume, old-growth forest below 800 feet elevation) for Sitka black-tailed deer due to the combined effects of previous and proposed timber harvest and road building may have adverse effects on the availability of deer for subsistence hunting and may result in a significant possibility of a significant restriction to subsistence hunting opportunities.

Current open road densities in the project area are 0.78 mile per square mile. Roads at these densities may adversely affect wolf populations.

Subsistence is an Alaska concern and a right protected by law. It is a significant issue that can be addressed within the wildlife issue.

This evaluation addresses the potential effects of harvesting suitable timber from the northern portion of Kuiu Island, on subsistence use of and wildlife habitat for Sitka black-tailed deer, black bear, marten, and the Alexander Archipelago Wolf.

3.3.1.1 Units of Measure

Connectivity will be analyzed through the effectiveness of the Forest Plan conservation biology strategy and the network of large, medium, and small old-growth habitat reserves within northern Kuiu Island.

The existing Forest Plan small old-growth habitat reserve values will be compared to the interagency recommendations.

Effects of harvest on Sitka black-tailed deer habitat will be compared by using acres of high value deer winter range affected by alternative.

Open road densities will be analyzed by comparing the effect of road densities in each alternative to the known effects to bear and wolves.

Comparison of alternatives uses the deer winter range model and analyzes effects of road densities to bear and wolves. Effects are related to the location, aspect, elevation, harvest method, and timber type of stands harvested.

3.3.2 Biodiversity

Biodiversity is a measure of the variety of all the plant and animal communities and species within an area, including the ecological processes that lead to maintenance of well-distributed viable populations of species. Habitat refers to the environment in which a species lives and thrives. Wildlife species may occupy one distinctive habitat type, a range of different habitats, or may change habitats seasonally.

The Tongass National Forest provides habitat for a variety of plant and animal species. The conifer forests of Southeast Alaska are divided into ten forest cover types and 57 plant associations (Forest Plan FEIS Part 1, pages 3-12 and 3-13). Approximately 54 species of mammals, 231 species of birds, and five species of amphibians and reptiles live in Southeast Alaska. An additional 18 species of marine mammals inhabit the offshore marine environment. About 45 other species of birds and three species of amphibians or reptiles are considered casual or accidental visitors to Southeast Alaska (Forest Plan FEIS Part 1, page 3-351).

There are over 500 species of lichens on the Tongass across all habitats (Geiser et al. 1998). At least one species (*Lobaria oregana*) could be used as an important indicator of normally functioning late successional forests at the stand level (Dillman 2003).

3.3.3 Habitat Connectivity

The old-growth forest habitat within the Kuiu Timber Sale Area occurs in landscape patterns of naturally-fragmented old-growth forest, muskeg, and forested wetlands. The majority of forest types in Southeast Alaska are not a continuous sea of "old-growth"; many are in different stages of stand development (Oliver and Larson 1996, Kramer 1997). A variety of successional pathways exist on wind-exposed landscapes (Nowacki and Kramer 1997, Kirchhoff and Thomson 1998). On Kuiu Island, as much as 30 percent of the forests may never reach late-seral stages because of the frequent, catastrophic wind storms (Bormann and Kramer 1998). Areas topographically protected from windstorms on Kuiu Island consist of about 35 percent of the forested area and these have a wide range of disturbance intensity and frequency (Bormann and Kramer 1998). The remaining 35 percent of forests may develop, after small-scale and partial or complete stand-replacement disturbances, into mid- to late-seral stages (Borman and Kramer 1998), better known as the understory reinitiation stage of stand development (Oliver and Larson 1996). It is estimated that medium to high-intensity windthrow has occurred on

approximately 20 percent of the productive forests on Kuiu Island (Kramer 1997, Jorgensen 1999, and Kramer et al. 2001).

Past timber harvest activities have resulted in additional fragmentation within some of the old-growth habitat areas. In contrast to fragmentation from natural disturbance events, where broken or fallen trees remain to contribute to the overall functioning of the old-growth habitat, timber harvest removes much of the wood biomass from an area. This old-growth habitat fragmentation, combined with the proposed harvest for this project, may have adverse effects on some old-growth associated wildlife species. Too much fragmentation could make an area unsuitable for some species in the short term, and could affect the ability of some species to travel between the remaining areas of old-growth habitat.

Landscape connectivity is the degree to which the landscape facilitates or impedes movement among habitat patches or the functional relationship among habitat patches (Tischendorf and Fahrig 2000). Connectivity does not necessarily mean that old-growth habitat areas need to be physically joined for all species, since many old-growth associated species across the Tongass can move or be carried across areas not in old-growth conditions (Forest Plan FEIS Part 1, p. 3-33). However, the Forest Plan also recognized that for species with limited dispersal capabilities, such as lichens, fungi, bryophytes, plants, and small-bodied animals, the corridors may be the only linkage between habitats and therefore need to function as breeding habitat. In these instances the habitat quality of these corridors is of utmost importance. Wider corridors are considered to be more effective at facilitating species movements. A functioning corridor should be continuous, maintaining a minimum width along its entire length. The corridor must also contain suitable habitat for the species that are expected to move within it.

The definition of a corridor and its function can vary according to the species that use it. Forested muskeg may act as a corridor for mobile species with less affinity to old-growth forest, whereas roads may act as corridors for wolves during winter. Productive old-growth stands provide corridors for species, such as marten, that do not use open landscapes (Suring et al. 1992), and small bodied animals that are not highly mobile (Pardini et al. 2005).

This analysis looks at two levels of connectivity: 1) the function of the old-growth habitat reserves identified in the Forest Plan, particularly the small old-growth habitat reserves, in providing connectivity for old-growth dependent species, and 2) connectivity of corridors linking productive old-growth habitat areas.

Although there are published studies that question the utility of corridors for species conservation, a review of these studies suggests that corridors can be effective and that studies that have been inconclusive were so largely due to design flaws (Beier and Noss 1998). The Forest Plan addressed landscape patterns including connectivity of old-growth patches by corridors (Forest Plan Final EIS Part 1, page 3-20). Two important landscape elements, beach and estuary fringe, and riparian areas, have special importance as components of old-growth forest and provide unique wildlife habitats as well as serve as wildlife travel corridors. The Tongass has established 1,000-foot buffers along beach and estuary fringes and 100-foot minimum buffers for riparian areas (buffer widths vary on riparian areas by stream class) where no programmed timber harvest is allowed.

3.3.4 Old-Growth Forest Habitat Conservation Strategy

3.3.4.1 Introduction

The Forest Plan contains a comprehensive conservation strategy to assure viable and well-distributed wildlife populations (Forest Plan FEIS Appendix, Volume 4, Appendix N, 1997). There are two components to this strategy: (1) establishment of a system of small, medium, and large old-growth habitat reserves (OGRs), and other non-development land use designations; and (2) management of the matrix of lands where development that would alter the old-growth forest ecosystem is allowed (productive old-growth). The following discussion concentrates on the first component and compares three options for design of the small old-growth habitat reserves in the Kuiu Timber Sale Area (VCUs 398, 399, and 402).

The habitat connectivity strategy described in the Forest Plan has three primary components:

- A network of land use designations (LUDs) for small, medium, and large old-growth habitat reserves, using old-growth habitat LUDs (25,171 acres on Kuiu Island)
- A forest-wide system of protection provided by other non-development LUDs that maintain the integrity of the forest-wide natural ecosystem and provide future options for maintaining naturally occurring ecosystems (282,558 acres on Kuiu Island)
- In LUDs where development may occur, maintenance of components of the naturally occurring ecosystem according to Forest Plan standards and guidelines, in order to protect important habitat elements and provide for habitat connectivity

An important aspect of the old-growth habitat reserve strategy is connectivity – maintaining corridors of forested areas between reserves so that old-growth associated species can travel between large and medium reserves and other non-development LUDs. This

connectivity is provided by a combination of non-development LUDs such as small old-growth habitat reserves, wilderness, beach and estuary fringe, and riparian management areas. The Forest Plan anticipated that some of the small OGRs would be adjusted during project level planning to better meet Forest Plan criteria and objectives.

3.3.4.2 Large and Medium Old-growth Habitat Reserves

There is a good science base for the "old-growth reserve" approach. *A Proposed Strategy for Maintaining Well-Distributed, Viable Populations of Wildlife Associated With Old-growth Forests in Southeast Alaska* (VPOP) (Suring et al. 1993) performed pioneering work in Alaska. The result was a landscape conservation strategy (based on the work of Thomas et. al 1990) that would sustain habitat to ensure maintenance of well-distributed viable populations of old-growth-associated species across the Tongass. Subsequent reviews of the VPOP strategy have been supportive (Suring et al. 1994, Kiester and Eckhardt 1994).

Currently there is one large OGR on Kuiu Island in the Tebenkof/South Kuiu Wilderness Area south of the project area. Two medium OGRs are adjacent to the project area, one in VCUs 400 and 401, and the other in VCUs 428 and 429. Three small OGRs are within, or adjacent to, the project area. They are located in VCUs 398, 399, and 402 (Figure 3-2).

3.3.4.3 Small Old-growth Habitat Reserves

The Forest Service identified and explicitly mapped small reserves to establish the Old-growth Habitat LUD areas in the Forest Plan process. In the objectives identified by VPOP, small reserves serve two principal functions:

- As corridors for habitat connectivity between large and medium reserves
- As functional habitat for species less able to disperse between larger reserves, specifically the flying squirrel, a species closely associated with mature forests

The Forest Plan mapping of small reserves considered both functions. However, both may not be simultaneously satisfied in each small reserve. A landscape linkage among reserves suggests a linear design of greater distance which would likely contain limited functional interior forest habitat. Conversely, habitat that is more circular than linear minimizes potential edge effects and maximizes interior forest habitat. Thus, two possibly mutually exclusive designs may allocate acres to small reserves. The Forest Plan revision used both designs, but functional contiguous habitat was generally preferred over linear

landscape connectivity because other Forest Plan features often provided the connectivity function (e.g. beach fringe and riparian corridors).

A total of 237 small reserves were mapped in the Forest Plan. They total nearly 270,000 acres of productive old-growth (POG) forest that would otherwise have been allocated to management LUDs in the Forest Plan. This is a substantial component of the forest-wide old-growth conservation strategy.

The Forest Plan (Appendix K) provided guidelines for further evaluating the design of small OGRs at the project level. The Forest Plan Appendix K criteria applicable to this analysis are listed below.

- The OGR should be a contiguous landscape of at least 16 percent of the area of the VCU.
- At least 50 percent of the OGR should be productive old-growth.
- The OGR should be more circular than linear in shape to maximize the amount of interior forest habitat.
- The amount of early seral habitat (young second growth) and roads within the OGR should be minimized.

Site-specific factors to help meet multiple biodiversity or wildlife habitat objectives should be considered. Factors to consider include, but are not limited to:

- important deer winter range to maintain deer habitat capability to meet public demand for use of the deer resource,
- known or suspected goshawk or marbled murrelet nesting habitat,
- the largest blocks of contiguous old-growth within a watershed, and
- rare features, such as underrepresented forest plant associations or stands with some of the Forest's highest volume timber.

3.3.5 Design Options for the Small OGRs

In a meeting with the Forest Service (conducted on December 1, 1998 in Petersburg, Alaska), the U.S. Fish and Wildlife Service (USFWS) and the Alaska Department of Fish and Game (ADF&G) expressed concerns about the size, shape, and connectivity of small old-growth habitat reserves on Kuiu Island, and options were designed for the OGRs of concern. An additional meeting and field trip to Kuiu Island took place in 2004 to review the proposed OGR changes suggested in the December 1998 meeting. The agency representative's agreed the options proposed in the Kuiu Timber Sale DEIS represented the changes discussed in earlier meetings. A discussion of this process entitled "Revision to Existing Small Old-Growth Habitat Reserves

(OGRs) on Kuiu Island" is included in the planning record for this project along with the recommendations to the Responsible Official for this and subsequent projects on Kuiu Island.

Two options for the design of each small OGR are analyzed in detail using the criteria from Appendix K of the Forest Plan (Table 3-7 thru Table 3-9 and Figure 3-3). The options include the original Forest Plan design, Option 1, and the design developed by USFWS, ADF&G, and the Forest Service during the 1998 meeting, Option 2.

3.3.5.1 Keku Small OGR (VCU 398)

Option 1 VCU 398

The Forest Plan OGR meets the objectives of the standards and guidelines as designed. However, its shape is linear, and it includes more acres of timber harvest and more miles of road than Option 2.

Option 2 VCU 398

Option 2 would decrease the amount of POG from the original OGR design. This redesign would reduce that acreage by about 200 acres. The western boundary would be expanded to make the OGR more circular. The area is within the land base for timber harvest but much of the timber is in stringers and may not be economical to harvest because of this natural configuration and low quality wood.

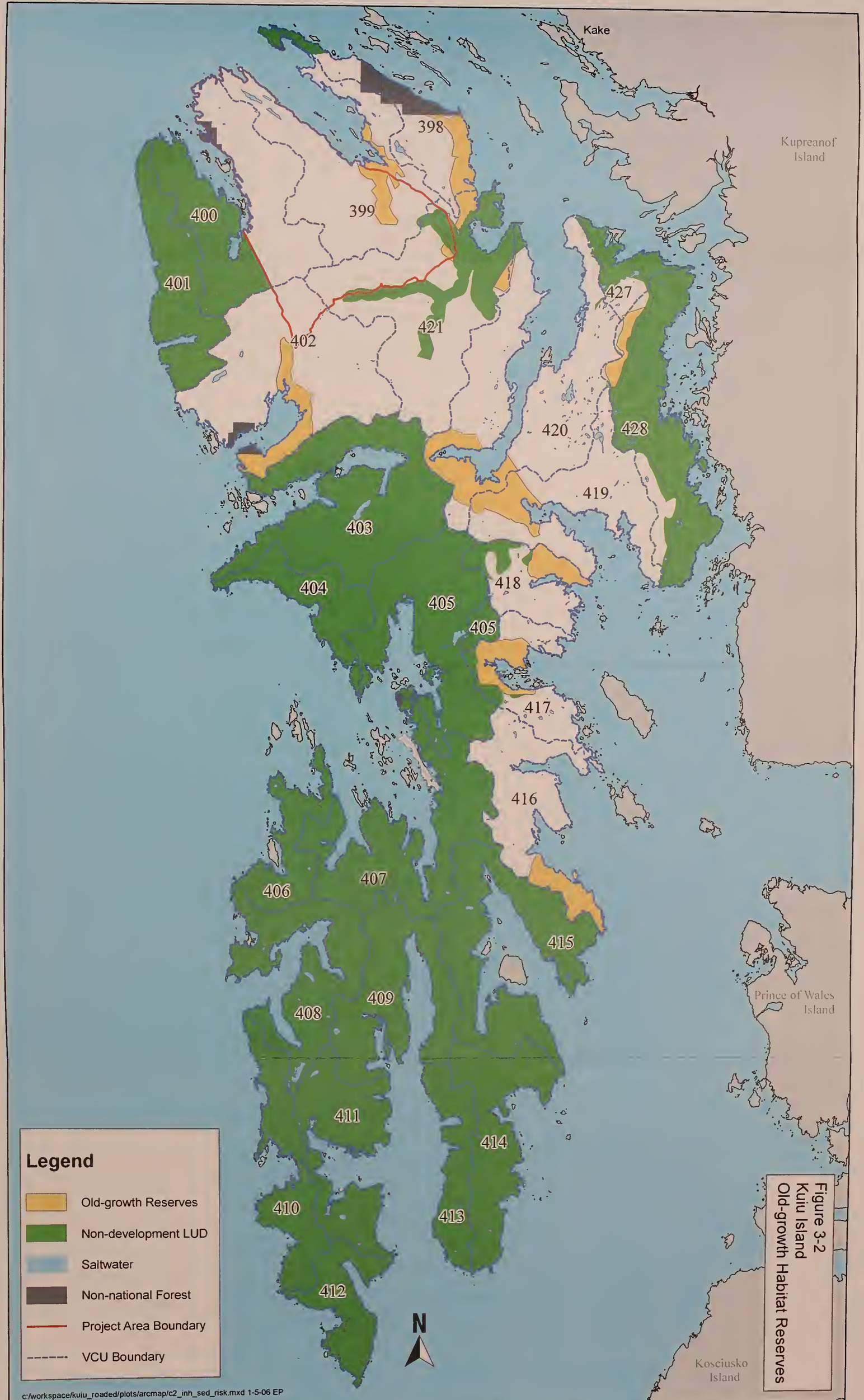
The southern boundary would follow the VCU boundary between VCUs 398 and 421 and run from the beach to the east. Table 3-7 and Figure 3-3 compare the Forest Plan small OGR with the proposed OGR for VCU 398.

Table 3 - 7 Small old-growth habitat reserve options for VCU 398

Forest Plan Appendix K Criteria for VCU 398		Option 1	Option 2
General Criteria			
Total acres - should be at least 2,112 acres[a]		2,237	2,305
Acres of POG – should be at least 1,056 acres[b]		1,458	1,236
Shape		Linear	Circular
Acres of early seral habitat included		455	126
Miles of classified road included		4.37	2.53
Site-specific Factors			
Acres of important deer winter habitat (HSI 0.6-1.0)		1,182	1,390
Acres of high value marten habitat (HSI 0.9 – 1.0)		1,466	2,473
Total acres of high volume strata		1,462	2,589
Total acres of medium volume strata		422	825
Total acres of low volume strata		52	166
Total acres below 1500 ft. elevation		2,322	3,668
Total acres below 800 ft. elevation		1,893	1,691
Contains the largest blocks of contiguous old-growth within a watershed?		Yes	Yes
Known or suspected goshawk nesting habitat		No	No
Connectivity to other OGRs		Yes	Yes
Known or suspected marbled murrelet nesting habitat		No	No
Rare features	Acres of coarse canopy forest	81	67

[a] 16 percent of VCU acres need to be within the small OGR

[b] 50 percent of the 16 percent must be in POG


Kake
Kupreanof Island
Prince of Wales Island
Kosciusko Island
398
399
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408
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412
N
Legend
Old-growth Reserves
Non-development LUD
Saltwater
Non-national Forest
Project Area Boundary
VCU Boundary
c:/workspace/kuiu_roaded/plots/arcmap/c2_inh_sed_risk.mxd 1-5-06 EP
Figure 3-2
Kuiu Island
Old-growth Habitat Reserves

Kuiu Timber Sale

Figure 3-3
Small Old-Growth Reserve
Options in VCUs
398, 399 and 402

Saginaw Bay
Keku Strait
Security Bay
Kadake Bay
Rowan Bay

398
399
400
401
402
403
403
419
420
421

Legend

- Forest Plan OGR (Option 1)
- Interagency OGR (Option 2)
- Recreational River
- Managed Stands
- Lakes/Saltwater
- Non-National Forest
- Forest Land Suitable for Commercial Timber Production
- Stream Value Class I & II
- Project Area Boundary
- VCU Boundary
- Existing Open Roads

N

0 1.25 2.5 5 Miles

3.3.5.2 Saginaw Small OGR (VCU 399)

Option 1 VCU 399

This is the existing small OGR identified in the Forest Plan. The interagency group of biologists who reviewed the OGRs on Kuiu Island concluded the Forest Plan small OGR is deficient in total acreage, lacks connectivity, does not have adequate productive old-growth (POG) acres, and includes several small islands off the coast of Kuiu Island, leading toward further fragmentation of this small OGR.

Option 2 VCU 399

Option 2 would be expanded toward the VCU boundary to the south to meet the Recreational River corridor, thus maintaining a travel corridor out of the VCU (one of USFWS concerns). The existing outline would be reconfigured and would not go up the beach fringe to the north nor would it include the small islands off the coast of Kuiu Island. The OGR boundary would remove as many of the harvest units and roads within the OGR as possible. This OGR would have more POG than required by the Forest Plan due to the natural composition of the forest in this VCU. Table 3-8 and Figure 3-3 display the small old-growth habitat reserve options for VCU 399.

3.3.5.3 Rowan Small OGR (VCU 402)

Option 1 VCU 402

Option 1 has more than the required acres of POG. However, it also has a large component of previously harvested stands and the total acreage does not meet Forest Plan minimums.

Option 2 VCU 402

The boundary would be moved to exclude as many managed stands as possible and the overall size would be increased to meet minimum size requirements. This OGR design follows the Rowan Creek drainage which would improve connectivity to other areas and would protect the low elevation high value wildlife habitat. Table 3-9 and Figure 3-3 display the small old-growth habitat options for VCU 402.

Table 3 -8. Small old-growth habitat reserve options for VCU 399

Forest Plan Appendix K Criteria for VCU 399		Option 1[a]	Option 2
General Criteria			
Total acres - should be at least 4,088 acres[b]		2,628	4,159
Acres of POG – should be at least 2,044 acres[c]		2,386	3,770
Shape		Linear	Circular-Linear
Acres of early seral habitat included		154	99
Miles of classified road included		2.91	4.75
Site-specific Factors			
Acres of important deer winter habitat (HSI 0.6 – 1.0)		508	523
Acres of high value marten habitat (HSI 0.9 – 1.0)		1,466	2,501
Total acres of high volume strata		1,462	2,623
Total acres of medium volume strata		422	852
Total acres of low volume strata		52	175
Total acres below 1500 ft. elevation		2,229	3,722
Total acres below 800 ft. elevation		1,893	2,082
Contains the largest blocks of contiguous old growth within a watershed?		Yes	Yes
Known or suspected goshawk nesting habitat		No	No
Connectivity to other OGRs		Yes	Yes
Known or suspected marbled murrelet nesting habitat		No	No
Rare features	Acres of coarse canopy forest	815	1,454

[a] Includes acres on several small islands off Kuiu Island shore
[b] 16 percent of VCU acres need to be within the small OGR
[c] 50 percent of the 16 percent must be in POG

Table 3 - 9. Small old-growth habitat reserve options for VCU 402

Forest Plan Appendix K Criteria for VCU 402		Option 1	Option 2
General Criteria			
Total acres - should be at least 5,197 acres[a]		4,044	5,273
Acres of POG – should be at least 2,599 acres[b]		3,198	4,220
Shape		Linear	Linear
Acres of early seral habitat included		215	361
Miles of classified road included		1.93	1.35
Site-specific Factors			
Acres of important deer winter habitat (HSI 0.6 – 1.0)		712	1,113
Acres of high value marten habitat (HSI 0.9 – 1.0)		1,895	2,520
Total acres of high volume strata		1,787	2,575
Total acres of medium volume strata		495	712
Total acres of low volume strata		360	371
Total acres below 1500 ft. elevation		3,963	5,008
Total acres below 800 ft. elevation		3,480	4,327
Contains the largest blocks of contiguous old growth within a watershed?		No	No
Known or suspected goshawk nesting habitat		Yes – directly adjacent	Yes – directly adjacent
Connectivity to other OGRs		Yes	Yes
Known or suspected marbled murrelet nesting habitat		No	No
Rare features	Acres of coarse canopy forest	541	748

[a] 16 percent of VCU acres need to be within the small OGR

[b] 50 percent of the 16 percent must be in POG

3.3.6 Environmental Consequences

3.3.6.1 Direct and Indirect Effects

The proposed changes to the small OGRs in VCUs 398, 399, and 402 constitute a non-significant amendment to the Forest Plan for the project area because it brings the existing small old-growth habitat reserves into compliance with Forest Plan direction. The small reserves in VCUs 419 and 420 were adjusted during the Threemile

timber sale and were analyzed in the Threemile FEIS. Proposed changes in small old-growth habitat reserves in VCUs 416, 417, and 418 will be analyzed when planning is done in those areas.

3.3.8. Affected Environment

Most impacts from timber harvest activities occur in productive old-growth habitats and are the main focus of this discussion since these areas are the most at risk (Table 3-10). These forests are an important component of the temperate rain forest ecosystem of Southeast Alaska comprising the majority of the forested lands in the Kuiu Timber Sale Area. This habitat consists of different tree species that vary in form, composition, function, and suitability to different species of wildlife.

Old-growth forest is structurally complex and provides unique habitat for many species of plants and animals. These forests have broken, multi-layered canopies through which sunlight penetrates to the forest floor. Water, disease, and wind act as the driving forces behind forest changes in Southeast Alaska.

3.3.8.1 Productive Old-growth (POG)

The trees growing in productive old-growth exhibit wide ranges of diameters, heights, and stand structure characteristics. This habitat contains high biological diversity by providing genetic source material to maintain populations of plants and animals (Roman et al. 2001).

Table 3 – 10. Historic and current POG acres

	1954 (historic condition)	2005 (existing condition)	Percent change from historic to existing condition[a]
WAA 5012	112,677 acres	90,856 acres	-19 %
Project Area (46,102 acres)	37,505 acres	27,112 acres	-28 %

[a] Change in POG includes harvest units and blowdown within project area.

3.3.8.2 High Volume Old-growth

High volume old-growth forests provide good thermal cover for wildlife in the winter. This habitat is given higher values when calculating the winter habitat capability for both deer and marten. All high volume strata less than 1,500 feet in elevation is considered high value habitat for marten and Queen Charlotte goshawk habitat, and high volume old-growth below 800 feet in elevation is considered high value deer habitat.

3.3.8.3 Medium Volume Old-growth

The stands are uneven-aged, with numerous gaps in the overhead canopy. The more open canopy results in a thicker understory, but it is subject to burial by snow in the winter. Huckleberry is more abundant on these sites and ferns are less common. Winter thermal cover for wildlife is generally considered moderate.

3.3.8.4 Low Volume Old-growth

The overstory is relatively open, with 20-50 percent canopy closure, and tree height typically less than 60 feet. Western hemlock and cedar predominate. With tall brushy thickets of blueberry and rusty menziesia, the production of forbs and ferns tends to be low. Lichens are relatively abundant. Thermal cover for wildlife is considered poor.

3.3.8.5 Effects to high, medium, and low POG

The proposed alternatives affect the high, medium, and low volume POG differently. High volume POG contains some of the highest biological diversity and has generally been harvested the most. Table 3-11 shows the historic, current, and proposed timber harvest of high, medium, and low POG within the project area.

Table 3 - 11. Effects of the proposed alternatives on POG habitat[a]

Productive Old -growth	Historical Condition (1954)	Alt 1 No Action	Alt 2	Alt 3	Alt 4 Proposed Action	Alt 5
Acres	**37,505**	27,112	26,628	26,329	25,710	25,906
High volume strata		21,251	20,849	20,622	20,062	20,304
Medium volume strata		5,211	5,147	5,078	5,028	4,982
Low volume strata		650	632	629	620	620
Percent current POG remaining after harvest		100%	98%	97%	95%	96%
Percent historic POG remaining after harvest		72%	71%	70%	69%	69%

[a] Acres of volume strata harvested in each alternative does not equal the total unit size due to some "non" POG acres identified in GIS. These acres may be "holes" of unidentified volume in the GIS layer, or MMI-4 Soils (see the Soils and Geology section in this chapter).

Approximately 28 percent of the historic POG has been harvested. Historic information of how much was high volume is not available. However Table 3-11 shows that a large percentage of the total POG is high volume; therefore it is likely that the majority of the volume previously harvested was high volume strata as well. It is possible to more accurately track the proposed actions on the current level of POG.

Alternative 2 would harvest 402 acres of high volume, 64 acres of medium volume, and 18 acres of low volume. Approximately seven acres appear as "non-volume" which represents nonforested areas within units or slivers of areas in GIS that have not been identified.

Alternative 3 would harvest 629 acres of high volume, 133 acres of medium volume, and 21 acres of the low volume. Approximately 11 acres appear as "non-volume" which represents nonforested areas within units or slivers of areas in GIS that have not been identified.

Alternative 4 would harvest 1,189 acres of high volume, 183 acres of medium volume, and 30 acres of low volume. Approximately 23 acres appear as "non-volume" which represents nonforested areas within units or slivers of areas in GIS that have not been identified.

Alternative 5 would harvest 947 acres of high volume, 229 acres of medium volume, and 30 acres of low volume. Approximately 25 acres appear as "non-volume" which represents nonforested areas within units or slivers of areas in GIS that have not been identified.

3.3.8.6 Coarse Canopy Old-growth

Certain types of old-growth habitat, particularly low elevation, very high-volume stands, are rare in the Tongass National Forest. Only four percent of the entire Tongass land base is composed of this type of old-growth. These sites are portrayed by volume class 6 and 7 and described as high volume – coarse texture. The term "coarse canopy" is used to describe these stands. These stands have low to moderate densities of tall large diameter trees that are consistently distributed within the stand. These stands are considered to be important to some old-growth associated species and may have areas containing the highest biological diversity (Caouette et al. 2000). Table 3-12 displays the existing amount of coarse canopy in the project area (Alternative 1), and the amount of coarse canopy proposed for harvest by alternative.

Table 3 - 12. Acres of coarse canopy (Volume Class 6 and 7) harvested by alternative

Project Area coarse canopy	1	2	3	4	5
Historic (1954)[a] acres	26,558	N/A	N/A	N/A	N/A
Current acres[b]	13,009	12,781	12,675	12,196	12,456
Percent change from historic condition	-51 %	-52 %	-52 %	-54 %	-53 %
Percent change from current condition		-2 %	-3 %	-6 %	-4 %

[a]Differences between historic and current acres include management activities such as timber harvest and road building as well as natural events such as windthrow. Acres of historic coarse canopy are approximate as coarse canopy was not measured in early harvest units.

[b] Acres are approximate and may differ due to rounding factors.

3.3.8.7 Matrix

A component of the old-growth conservation strategy is the availability of management lands subject to timber harvest, or the "matrix." Forest Plan standards and guidelines that apply to these lands prohibit timber harvest over much of the area to protect specific resource and landscape components. Examples include riparian buffers, beach fringes and estuary areas, and areas with soils and water standards and guideline exemptions. On average, 57 percent of the original 1954 (pre-industrial timber harvest) forest lands within the matrix will remain unharvested on a forest wide basis (Forest Plan FEIS p. 3-382). Within the project area least 35 percent of the matrix lands are unavailable for timber harvest consideration and will not be harvested (Forest Plan FEIS p. 3-387). They will remain standing throughout the 100 year planning horizon.

Some components of the matrix are spatially explicit such as the complete protection of the 1,000-foot beach and estuary fringe throughout the Tongass. This area represents a substantial amount (26,648 acres on Kuiu Island; 2,672 acres in the project area) of the retained natural forest mosaic. Riparian buffers were designed to maintain the integrity of the riparian ecosystem and not diminish the capability of these systems to produce aquatic resources. Other standards and guidelines preclude or significantly limit timber harvest

on high hazard soils, karst terrain, visually sensitive areas along marine highway routes, and areas technically infeasible for timber harvest.

3.3.8.7 Direct and Indirect Effects

The amount of productive old-growth habitat in the project area is well within the Forest Plan predictions. Depending on which action alternative is chosen, between 69 and 71 percent of the historic POG would remain in the project area following harvest.

Coarse canopy old-growth habitat in the project area has been reduced by approximately 51 percent from historic levels (1954). The action alternatives would cause an additional two to six percent reduction depending upon which alternative is chosen.

3.3.9 Management Indicator Species and Species of Concern

Management indicator species (MIS) are those wildlife species whose responses to land management activities can be used to predict the likely response of a wide range of other species with similar habitat requirements. Under the MIS concept, the responses to management activities of relatively few species are studied and monitored in order to predict the impacts to entire assemblages of species and associated habitats (Table 3-13). MIS are used to assess population viability and biological diversity.

The following MIS are known to occur on Kuiu Island: Sitka black-tailed deer, Alexander Archipelago wolf, American marten, black bear, river otter, red squirrel, bald eagle, red-breasted sapsucker, hairy woodpecker, and brown creeper. These species, with the exception of black bear, wolf, and red squirrel, are associated with old-growth forests during part of their life cycle and therefore may be affected by the proposed management activities in the project area.

Impacts to MIS species will be assessed by applying Habitat Capability Modeling (HCM) to Sitka black-tailed deer and American marten, as well as analysis of site-specific habitat features such as snow levels, high volume old-growth habitat, fragmentation and condition of interior forests, elevation, and local knowledge of the area. The wildlife models are best suited, by their nature, for comparison of proposed land management activities. These models should not be used to predict animal population numbers at some future date.

The model outputs are best used as an index of risk to rank planning alternatives. For example, the statement "the model predicts a habitat capable of supporting 324 animals by year 2054 in Alternative 1" is misleading. This infers that the model has the ability to predict habitat capability for animal numbers. Conversely, the statement "of the five alternatives, Alternative 1 has the highest habitat capability score at year 2054" is more useful. This correctly implies that habitat features

associated with animal use will be more abundant in Alternative 1. Experimentally, the link between habitat capability and actual wildlife population has not been proven.

How habitat scores affect the fundamental limits governing animal populations has not been determined. It is assumed that a reduction in habitat suitability index (HSI) scores results in a reduction in carrying capacity. To understand the effect of habitat changes on populations, we need to link HSI scores to mortality, natality, habitat patch size, and emigration and immigration estimates. Furthermore, to predict a future population, information is needed on the population's current density, age, and sex composition.

Table 3-13. Management Indicator Species and Species of Concern

Management Indicator Species	Potential habitat in project area?	Carried forward for analysis?
Sitka Black-tailed Deer	YES	YES
Alexander Archipelago Wolf	YES	YES
American Marten	YES	YES
Red Squirrel	YES	No. There is no concern with red squirrel habitat; leave trees, riparian buffers and the matrix retain sufficient habitat.
River Otter	YES	No. The majority of river otter habitat is protected by Forest Plan standards and guidelines.
Black Bear	YES	YES
Bald Eagle	NO	No. The majority of bald eagle nesting and foraging habitat is protected by Forest Plan standards and guidelines.
Hairy Woodpecker, Brown Creeper	YES	No. Cryptic behavior and the difficulty in monitoring these species.
Neotropical Migratory Birds	YES	No. Habitat considerations are included in biodiversity (i.e., old-growth) analyses.

In short, biologists are unable to predict wildlife populations into the future, except in the most general of terms. Maybe thinking of "phantom" or "paper" animal numbers will assist in understanding

these figures. These are the animals that a particular habitat could produce if biologists had perfect knowledge of the existing habitat, animal numbers, predation, and disease agents in the population.

For a more in-depth discussion of the reliability of habitat capability models please refer to "The Role and Reliability of Habitat Capability Models" (DeGayner 1992, available in the project planning record).

The model is a good tool to compare the changes in habitat between historic, current, and proposed actions and will be used as such.

3.3.9.1 American Marten

An important furbearer representing upland forested old-growth (forests with large snags, and downed logs for dens and prey habitat), marten are sensitive to human access. Saltwater and freshwater influence zones and upland old growth forests are important ecological zones.

Marten are members of the weasel family and are dependent on over-mature forests, including beach fringe and riparian habitats. Marten prefer mature conifer or mixed forest stands, although they may be adaptable to a variety of forest habitats (Soutiere 1979). Use of habitats by marten depends upon occurrence and availability of food and cover characteristics.

Snags provide important den sites for marten for resting activities in both winter and summer (Spencer 1987). They use the tops of broken snags as resting sites in the summer and cavities in winter and summer. Preferred snags range from 14 to 49-inches DBH (Campbell 1979, Spencer 1987).

Forest Plan Marten Standards and Guidelines

Standards and guidelines found in the Forest Plan mitigate harvest activities on marten habitat. Kuiu Island does not occur within one of the biogeographic regions where high risks have been determined. Recently, however, there has been concern expressed about the metapopulation of marten found on Kuiu Island. It has been hypothesized that the coastal subspecies (*Martes caurina*) and the continental subspecies (*Martes americana*) are hybridizing. Because very narrow stretches of saltwater separate the islands of Mitkof, Kupreanof, and Kuiu from each other and the mainland, this immigration appears to be a natural occurrence (Cook et al. 2001).

Marten Habitat Capability Model

The Forest Plan marten model (Suring et al. 1991) was used to analyze the effects of the alternatives on marten in the Kuiu Timber Sale Area. The model assumes that optimal habitat for marten must have: (1)

sufficient protective canopy cover, and (2) available prey species. A habitat suitability index (HSI) is assigned to areas based on volume, stand size class (stand age), presence of beach fringe or riparian habitat, and elevation. The model assumes that habitat with an HSI value of 1.0 is capable of supporting a marten population density of 2.7 marten per square mile. The result is a theoretical maximum carrying capacity and does not represent actual population numbers. Figure 3-4 displays the marten habitat capability values in the Kuiu Timber Sale Area. This habitat also represents important Queen Charlotte goshawk nesting and foraging habitat (TPIT 1998).

The marten model results show that the current marten habitat capability in the project area is approximately 23 percent lower than the historic (1954) condition (Table 3-14). This reduction is a result of previous timber harvests in the area.

Table 3 - 14. Marten habitat capability in the Kuiu Timber Sale Area

Habitat capability		Percent change from historic (1954) condition
Historic (1954) condition	146	0
Current (2005) condition	112	23%

[a] theoretical maximum number of marten that the project area can support over time, according to the current marten habitat capability model

Table 3-15 displays the effects of the alternatives on marten habitat capability in the Kuiu Timber Sale Area. As the table shows, the direct effects of the alternatives on marten habitat capability in the project area are small. The reduction in current marten habitat capability in the project area would range from less than one percent in Alternative 2, to up to four percent in Alternatives 4 and 5. This would amount to a cumulative reduction of 24 to 26 percent, depending on the action alternative selected, when considering the effects of past timber harvest that have occurred since 1954.

Table 3 -15. Marten habitat capability in the Kuiu Timber Sale Area by alternative

Historic marten habitat capability (146)[a]	Alternative				
	1	2	3	4	5
Marten habitat capability after harvest	112	111	110	108	108
Change from current (2005) condition		-<1%	-2%	-4%	-4%
Percent change from 1954	-23%	-24%	-25%	-26%	-26%

[a] theoretical maximum number of marten that the project area can support over time, according to the current marten habitat capability model

High Value Marten Habitat

High value marten habitat is defined as high volume strata old-growth stands below 1,500 feet in elevation. These areas have a marten habitat suitability index (HSI) of 0.9 and above. This habitat type also represents highly suitable goshawk nesting and foraging habitat. Table 3-16 compares the current (2005) acres of high value marten habitat in the Kuiu Timber Sale Area to the historic (1954) condition. To put these values into a broader ecological perspective, these changes are compared to the changes that have occurred within Wildlife Analysis Area (WAA) 5012.

Table 3-16 shows that high value marten habitat acres have been reduced approximately 29 percent within WAA 5012, compared to a reduction of approximately 34 percent within the Kuiu Timber Sale Area. The effects of the alternatives on the amount of high value marten habitat remaining in the project area are shown in Table 3-17. The reduction in the acres of current high value marten habitat would range from approximately two percent in Alternative 2 to approximately six percent in Alternative 4.

Kuiu Timber Sale
Figure 3-4
High Value Marten Winter Habitat

Legend

- High Value Marten Winter Habitat HSI .9-1
- Managed Stands
- Non-National Forest
- Lakes/Saltwater
- Unit Pool
- 500ft Contour Interval
- Project Area Boundary
- Existing Open Roads

Saginaw Bay
Keku Strait
Security Bay
Kadake Bay

N

0 0.5 1 2 3 4 Miles

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Table 3 - 16. High value marten habitat acres compared to historic (1954) condition – WAA 5012 and the Kuiu Timber Sale Area

WAA 5012	**Historical (1954) condition**	72,847
	Current (2005) condition	51,614
	Percent change	-29%
Kuiu Timber Sale Area	**Historical (1954) condition**	30,110
	Current (2005) condition	19,778
	Percent change	-34%

Table 3 -17. High value marten habitat in the Kuiu Timber Sale Area remaining after harvest by alternative

Historic condition - 30,110 acres	**Alternative**				
	1	**2**	**3**	**4**	**5**
Acres remaining after harvest	19,778	19,375	19,148	18,602	18,839
Percent reduction from current condition	0%	2%	3%	6%	5%
Percent reduction from historical condition[a]	34%	36%	36%	38%	37%

[a] It is estimated that there were approximately 30,110 acres of high value marten habitat in the Kuiu Timber Sale Area in 1954. This is the figure used to represent the "historical condition."

3.3.10 Sitka Black-tailed Deer

The Sitka black-tailed deer receives the highest sport hunting and subsistence use of all terrestrial species in Southeast Alaska. In ADF&G's Game Management Unit 3, where Kuiu Island is located, deer are extremely important. All the communities in this region utilize this resource. Maintaining sufficient habitat to ensure the continued existence of this species is a priority for the Forest Service.

Sitka black-tailed deer is a MIS that prefers higher volume old-growth forests during winters with deep snow conditions. Young clearcuts provide poor winter habitat because they lack overstory canopies that can intercept snowfall. Older second-growth stands are typically poor winter habitat because they generally have closed canopies that shade out understory forage species. Important deer wintering areas within

the Kuiu Timber Sale Area include lower elevation forests on south aspects and adjacent to marine waters where snowfall is somewhat moderated by warmer weather.

The quantity and quality of winter habitat is considered the most limiting factor for Sitka black-tailed deer in Southeast Alaska (Suring et al. 1992). Winter snow conditions affect deer populations through decreased forage availability, specifically in clearcut areas, and increased energy expenditures. The highest quality winter habitat exists on south-facing slopes below 800 feet in elevation, dominated by stands of timber in the high volume old-growth strata. The combination of a dense canopy with scattered openings allows forage growth in the openings, while the canopy modifies snowfall sufficiently to promote availability of forage and movement of deer.

Early successional stands provide forage for deer during mild winters and the remaining seasons. Sitka black-tailed deer disperse through and use a variety of vegetation communities throughout the year, and no specific corridor requirements have been identified.

Every 20 to 40 years a severe winter kills large numbers of deer. On the Petersburg Ranger District, this last occurred during the winters of 1971-72 (Brainard 1996). Cold weather with higher than normal persistent snowfall caused the animal populations to decline.

The deer returned rapidly on Prince of Wales and Admiralty Islands but not on Kuiu, Kupreanof, and Mitkof. The die-off was more severe on the islands of Kuiu, Kupreanof, and Mitkof for several reasons:

- Wolf populations were rebounding from the discontinued wolf control program of the late 1960s.
- Weather patterns kept the snow pack from melting.
- Heavy black bear and wolf predation kept the population low.

Currently, deer populations have rebounded to a huntable population. In 1992, ADF&G re-opened the hunting season for deer on all islands in Game Management Unit 3 (Mitkof, Kupreanof, and Kuiu Islands).

3.3.10.1 Direct and Indirect Effects

Effects of silvicultural treatments on deer habitat

Changes in deer habitat from timber harvest may increase populations in the short-run. However, if stands mature in a natural fashion, habitat will decrease in value over time through plant succession. Several silvicultural treatments are available to maintain the habitat value for deer, and other species, through time. Pre-commercial thinning, commercial thinning, and pruning may help maintain the understory in these stands longer.

It was speculated in the Crane/Rowan Mountain FEIS, that partial harvest prescriptions would have no major impact on the deer population on Kuiu Island. This prediction was based on the small percent of the stand removed. These prescriptions were developed by observing the natural patterns of wind damage on Kuiu Island. Mimicking the within-stand structures produced by these occurrences allows removal of a high value forest product while not disrupting animal populations. However, individual animals within a population may be disturbed for the duration of harvest activities.

Historic partial harvest treatments (50 percent retention) on the Tongass National Forest studied by Bob Deal (2001) show that these treatments could provide deer food and habitat better than clear-cut treatments. Partial harvest stands do not show the dramatic rise and fall of blueberry abundance in stands 20 to 80 years after clearcutting. Deal also noted that the decrease in blueberry abundance following partial harvest was small when compared to that of clear-cutting. Community plant structures in the forests of Southeast Alaska appear to be resilient to moderate ranges of partial cutting (below 50 percent basal area removal). Overall, partial cutting maintained diverse and abundant plant understories comparable to the plant communities typically found in old growth stands (Deal 2001).

Partial harvest can increase both deer and moose use of areas. In Thomas Bay, the Petersburg Ranger District harvested two 20-acre blocks. One block had 20 percent of the volume in an overstory removed and the second block had 40 percent removed. This harvest occurred in 1983-84. In 1995, Petersburg District wildlife biologists Joe Doerr and Jim Brainard returned to measure moose and deer use of these two treatments and compared the results to two 20-acre untreated blocks directly adjacent to the treatment plots. The 20 percent and 40 percent overstory removal treatments increased the deer and moose use by 80 to 280 percent for these two treatments, respectively (Doerr 1995).

Within the project area, harvest varies by alternative and by prescription. When the prescription is combined with the important deer winter habitat, which is also recognized as high value habitat for marten and goshawk (POG below 800 feet in elevation), the effects of the proposed alternatives can be measured through the reduction of acres of this high value habitat by prescription (Table 3-18).

Table 3 - 18. Acres of POG high value wildlife habitat (below 800 feet) harvested

Current Condition: 14,481 acres POG below 800 feet	Alt 1 (current condition)	Alt 2	Alt 3	Alt 4 (proposed action)	Alt 5
Acres harvested below 800 ft with 50% retention	0	151	146	141	0
Acres clearcut below 800 ft.	0	96	90	341	446
Total acres harvested below 800 ft.	0	247	236	482	446
Percent of total acres harvested below 800 ft with 50% retention		61%	62%	29%	0

3.3.10.2 Deer Habitat Capability Model

The deer habitat capability model developed for the Forest Plan was used to predict the potential number of deer that the habitat within the Kuiu Timber Sale Area can support over time. The result is not an actual population number, but a theoretical long-term carrying capacity given normal winter conditions.

The habitat capability models used for the Forest Plan analysis are useful for comparing alternatives, but were never meant to predict population numbers (DeGayner 1992; Person 2001). They do this, but they will probably overestimate the population predictions by approximately 30 percent (Person et al. 1997). Rather, these models were designed to make distinctions between alternative treatments and they do this relatively well.

The Habitat Suitability Index (HSI) generated by the deer habitat capability model ranges in value from 0, indicating no habitat value, to 1.3, indicating the optimal habitat value. The deer model assigns the highest HSI value (1.3) to areas in high volume strata on south-facing slopes below 800 feet elevation where average winter snow depths are low. The lowest values (0.01-0.02) are assigned to harvested stands greater than 25 years old and less than 200 years old, and harvested stands less than or equal to 25 years old in areas with high average winter snow depths. Productive old-growth forest and harvested stands up to 25 years old receive moderate to high scores depending on aspect, elevation, and average winter snow depths. Areas above 1,500 feet elevation are not considered suitable for deer winter habitat and receive an HSI score of 0.

The deer model assumes that an area with an HSI value of 1.0 could support 100 deer per square mile. The result is a theoretical long-term deer carrying capacity, or deer habitat capability, for the project area based on the area's cumulative HSI values. This number represents the theoretical maximum number of deer that an area can support over the long term, assuming normal winter conditions. It is useful for estimating changes in habitat capability resulting from timber harvest activities, but is not intended to estimate actual deer populations.

Habitat Capability Models have been used by the Forest Service to document the suitability of habitat for wildlife species (Noss 1990). These models use physical and biological characteristics to determine a Habitat Suitability Index (HSI) value for all habitat types throughout the area of analysis. Acres within the analysis area are assigned an HSI value by the model. Acres with a zero value (such as lakes) are removed from the data as they have no habitat value for deer and the remaining acres are divided into four groups of somewhat equal size called quartiles. Each quartile is given a value between 1 and 4 with 1 being the lowest value habitat and 4 the highest value winter habitat[1]. High value deer habitat is evaluated and assigned for each project area and may vary between analysis areas.

The deer model was run for WAA 5012, of which the Kuiu Timber Sale Area is a part (Table 3-19), to calculate the quartile groups for the HSI values. The results were generated using the quartile model developed by the Forest Service and the State of Alaska as a means of describing important deer winter range (Agreement No. 00MOU-111001-026). Pre-harvest conditions present in 1954 were used to give a general indication of the overall habitat quality within the WAA.

The HSI values established in this method were then assigned to similar habitat types within the project area. The changes between historic and current conditions are shown in Table 3-20.

All HSI values have the capability to support deer to some level. As stated above the higher the HSI value the better the deer habitat (Table 3-21).

[1] Because HSI values are not distributed equally among the acres of deer habitat, HSI values are divided as close to four equal areas as possible.

Table 3 -19. WAA 5012 deer habitat suitability indices – historic (1954) and current (2005) condition

Quartile	HSI values	1954 acres	2005 Acres	Percent change
1	0.01 - 0.20	30,536	50,023	+39%
2	0.23 - 0.36	32,929	33,393	+1%
3	0.40 - 0.5	27,798	21,643	-22%
4	0.60 - 1.0	35,766	21,971	-39%

Table 3 -20. Kuiu Timber Sale Area deer habitat suitability indices – historic (1954) and current (2005) condition

Quartile	HSI values	1954 acres	2005 Acres	Percent change
1	0.01 - 0.20	6,872	16,613	+59%
2	0.23 - 0.36	20,486	10,369	-49%
3	0.40 - 0.50	11,546	8,411	-27%
4	0.60 - 1.0	13,313	6,824	-49%

Table 3 – 21. Deer habitat capability of WAA 5012 by alternative

	1954	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Estimated number of animals [a]	8,535	6,641	6,614	6,606	6,569	6,581
Percent change from historic condition		22%	23%	23%	24%	23%
Percent change from current condition			<1%	<1%	1%	1%

[a] theoretical maximum number of deer that the project area can support over time, according to the current deer habitat capability model

Tables 3-22 and 3-23 show that the capability of the project area to support deer has been reduced approximately 31 percent as a result of previous timber harvest, and by 2045 the deer habitat capability will have declined a total of 34 percent. As mentioned previously, as the stands reach the stem exclusion age, which the deer model assumes will occur at 26 years after harvest, deer habitat is reduced with the loss of browse. Many of the existing managed stands in the project area are over 30 years of age, so the modeled decline may have begun to occur. Those stands under 30 years of age will show a decline in deer habitat capability within a few years, according to the model. The year 2045 is used to represent the future condition in this analysis to include the effects of the proposed timber harvest on future deer habitat capability in the project area.

Table 3 - 22. Historic (1954) and current (2005) deer habitat suitability indices for deer winter habitat in the Kuiu Timber Sale Area

HSI	Acres[a]	Deer habitat capability	Acres[a]	Deer habitat capability
	1954		2005	
.01-.02	0	0	5,637	13
.03-.09	1,006	11	1,557	18
.1-.19	4,943	110	7,667	166
.2-.28	6,668	250	7,903	292
.3-.39	4,741	232	4,217	207
.4-.45	4,492	287	3,728	239
.5-.56	7,054	551	4,683	366
.6-.65	4,450	417	2,355	221
.7-.78	0	0	0	0
.8	5,334	667	2,687	336
1.0	3,529	551	1,781	278
1.1-1.3	0	0	0	0
Total	44,217	3,076	42,217	2,136

[a] acres are rounded to the nearest whole acre

Table 3 - 23. Deer winter habitat capability in the Kuiu Timber Sale Area

	Deer habitat capability[a]	Percent change from original (1954) condition
Historic (1954) condition	3,076	N/A
Current (2005) condition	2,136	31%
Future (2045) condition	2,034	34%

[a] theoretical maximum number of deer that the project area can support over time, according to the current deer habitat capability model

Table 3-22 displays the historic and current range and acres of HSI values in the Kuiu Timber Sale Area and the associated deer habitat capability represented by each range of HSI values. The differences between the 1954 and 2005 ranges give a general indication of how previous timber harvests have changed the area's ability to support deer in the project area. Currently, for example, there are approximately 5,637 acres of deer winter habitat with HSI values of .01-.02 whereas the 1954 values in Table 3-22 show zero acres of this habitat. These acres represent managed stands that have reached the stem exclusion stage, which is modeled to occur at 26 years after harvest.

Table 3-24 displays the effects of the alternatives on deer habitat capability in the Kuiu Timber Sale Area. The results indicate that the decrease in current deer habitat capability in the project area, as a result of the proposed timber harvest, would range from two percent to approximately four percent, depending on the alternative selected. When all existing and proposed managed stands have reached the stem exclusion stage by the year 2045, the model predicts that the cumulative decline in the project area deer habitat capability would range from 34 to 37 percent, depending on the alternative selected. This analysis does not include the potential benefits from thinning.

High Value Deer Winter Habitat

For this analysis, high value deer winter habitat was identified using the quartile approach mentioned above. This analysis showed that the highest HSI values on roughly 25 percent of the deer habitat acres (35,766 acres) in WAA 5012 ranged from 0.6 to 1.0 prior to 1954 when large scale commercial timber harvest began on the Tongass (Table 3-19). This represents the top quartile of deer winter habitat values in the subsection. Since the Kuiu Timber Sale Area is part of this WAA, these HSI values were used to represent high value deer

winter habitat in the project area for this analysis. Past timber harvest in the WAA has reduced the top quartile deer winter habitat to approximately 21,971 acres, a reduction of approximately 39 percent. A review of the historic high value deer winter habitat within the Kuiu Timber Sale Area shows a reduction of approximately 49 percent indicating that harvest has been more concentrated within this portion of the WAA (Table 3-20).

Other areas known to be important deer winter habitat such as low elevation (below 800 feet) POG are also analyzed in this EIS.

Figure 3-5 displays the current deer HSI values by quartile for the Kuiu Timber Sale Area. Future declines in deer HSI values predicted by the deer model are shown for the year 2045 in Figure 3-6.

The high value deer winter habitat within the project area would be reduced between two and five percent from the current condition depending on the alternative (Table 3-25). The reduction in high value winter habitat within the project area compared to the historic conditions would range between 49 and 51 percent depending on the alternative.

Table 3 - 24. Deer winter habitat capability in the Kuiu Timber Sale Area by alternative

Historic habitat capability (3,076)	Alternative				
	1	2	3	4	5
Deer habitat capability after harvest	2,136	2,092	2,081	2,046	2,058
Change from current (2005) condition	0	2%	3%	4%	4%
Percent change from 1954[a]	31%	32%	32%	33%	33%
Deer habitat capability in 2045	2,034	1,997	1,983	1,935	1,950
Percent change from 1954 to 2045	34%	35%	36%	37%	37%

[a] According to the deer habitat capability model, the Kuiu Timber Sale Area deer habitat capability was approximately 3,076 deer in 1954, which is the base year used in the Forest Plan to represent the year that large scale commercial timber harvest began on the Tongass.

Table 3 - 25. Acres high value deer winter habitat in the Kuiu Timber Sale Area by alternative

HSI value 0.6 – 1.0	Alternative				
	1	2	3	4	5
Acres high value in project area	6,824	6,696	6,694	6,513	6,578
Percent change from present condition		2%	2%	5%	4%
Percent change from 1954 to 2045	49%	50%	50%	51%	51%

Hunting

While Kuiu Island seems to be getting more use, there has been no significant change in the number of deer harvested.

In Game Management Unit (GMU) 3, on average 36 percent of the deer were harvested using the road system while 47 percent of the deer harvested were taken using a boat for access (ADF&G hunter surveys). The majority of the animals taken from the road system were along the Mitkof, Zarembo, and Kupreanof (Portage Bay, Kake, and Lindenberg Peninsula) road systems. It is possible that several were taken from the Kuiu road system but the method of harvest was only recorded by GMU not by island.

On Kuiu Island the majority of boat hunting occurs in Port Camden, Kadake, East Kuiu, and Rocky Pass. The majority of hunting by road occurs around Rowan Bay and the inland areas of the island.

The harvest from Kuiu Island constitutes only three percent of the total harvest for GMU 3, with an average of 18 animals harvested yearly on an island of approximately 482,102 acres (ADF&G hunter surveys). There is no known biological concern with the harvest of deer on Kuiu Island based on ADF&G and Forest Service data.

Kuiu Timber Sale

Figure 3-5

Deer Winter Range 2005

Legend

- High Value HSI .6-1
- HSI .4-.5
- HSI .23-.36
- HSI .01-.2
- Unit Pool
- Non-National Forest
- Lakes/Saltwater
- Project Area Boundary
- Existing Open Roads
- 500ft Contour Interval

N

0 0.5 1 2 3 4 Miles

Kuiu Timber Sale

Figure 3-6

Deer Winter Range for 2045

Legend

- High Value HSI .6-1
- HSI .4-.5
- HSI .23-.36
- HSI .01-.2
- Unit Pool
- Non-National Forest
- Lakes/Saltwater
- Project Area Boundary
- Existing Open Roads
- 500ft Contour Interval
- Stream Value Class I & II

Saginaw Bay

Security Bay

Kadake Bay

N

0 0.5 1 2 3 4 Miles

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3.3.11 Black Bear

Black bear inhabit the project area and use a variety of habitat types for forage, denning, and cover. Saltwater and freshwater influence zones are of ecological importance to bears. Black bear in Southeast Alaska use hollow logs and trees for denning sites (Erickson et al. 1982). These features are numerous due to the natural disturbance patterns found in this rainforest.

Black bear distribution occurs over 75 percent of Alaska (Johnson 1978). Little is known about black bear populations in Southeast Alaska, although densities occurring on Kuiu Island seem very high. A study conducted by Peacock (2004) has produced population estimates on north Kuiu Island of 1.5 bears/km^2, which is one of the highest recorded bear densities in North America. From her research, Peacock expressed concern about this population, suggesting additional harvest could cause a change in the population when the stem exclusion stage begins (Peacock 2004).

3.3.11.1 ADF&G Harvest Data

Approximately three percent of successful hunters use vehicles to hunt black bear on Kuiu Island. This has ranged from 0 to 14 percent since the 1988-89 hunting season. Using boats and hunting from the beach are the most successful means for taking black bear on Kuiu Island (mean 84 percent, range 73 to 91 percent). For the remainder of GMU 3, hunters accessing the area by roads are successful an average of 17 percent of the time (range 12 to 21 percent).

For eleven years ADF&G has been tracking the skull measurements of black bear harvested on Kuiu Island, with measurements averaging 18.6 inches, which is greater than the State's management objective for GMU 3 (18.5 inches). Seventy-nine percent of black bear harvested were male, well above the State's management goal of 75 percent. Each successful hunter hunted an averaged of three to four days before harvesting a bear. These data indicate a relatively stable population since the 1988-89 season.

Since 1991 the mean age of harvested male black bears on Kuiu Island has been 8.1 years (ADF&G Harvest Summaries 1991-2004). The age of harvested female black bears has been less consistent, but the 1998-99 mean ages showed an increase similar to the male cohort. The data suggest a relatively stable population on Kuiu Island.

3.3.11.2 Roads

Open road density in the project area would remain the same if the no-action alternative is selected, and would be reduced from the existing level of 0.78 mi/mi^2 to between 0.63 and 0.67 mi/mi^2 if an action alternative is chosen. This project may affect individual bears negatively by adding additional disturbed areas, reopening old roads,

and constructing new temporary roads, which would increase road density and therefore human access, and may increase hunter success in the short-term. However, implementation of road management objectives, and the retention of structure within proposed harvest units would mitigate risks to black bear populations from the proposed project. By closing new temporary roads and placing other existing and re-opened roads into storage, black bear disturbances would be mitigated in the long-run.

3.3.11.3 Timber harvest

The Forest Service has developed different timber harvest prescriptions to ensure adequate habitat for black bear and other species. Through implementation of prescriptions that remove approximately 50 percent of the overstory, the Forest Service hopes to mimic natural disturbance as much as possible with managed stands. Using these retention prescriptions should result in little or no appreciable effect to the wildlife populations. However, individual animals may be affected for a short time.

3.3.11.4 Hunting

The black bear is an important game animal in Southeast Alaska. All rural residents of Alaska have subsistence rights on Kuiu Island, and the remainder of GMU 3, for black bear harvest. In GMU 3, where Kuiu Island is located, the bear is becoming increasingly important not only to resident subsistence hunters but to resident and out-of-state trophy hunters as well. Concern over the increasing harvest of black bear on Kuiu Island, especially by non-resident hunters, has led ADF&G to reduce the black bear harvest on Kuiu Island to 120 animals annually for non-residents.

In the past, black bear harvests have been relatively stable at about 80 to 100 animals harvested annually. ADF&G changed the black bear harvest in the 2000-2001 hunting season for non-residents by adjusting season dates for Kuiu Island. They have assessed these adjustments annually but have not allowed for more than 120 animals harvested by non-resident hunters per season since implementation of these harvest restrictions. If the number of animals harvested in the spring hunt reaches 120, the fall season will be closed by emergency order. A closure occurred in the 2001-2002 season.

Black bear populations on Kuiu Island appear to be stable. There is no evidence that the black bear population on Kuiu Island is over-harvested at this time. However, the Forest Service and ADF&G agree that it would be prudent to use a conservative approach in managing black bear on Kuiu Island. The ADF&G and the Forest Service will cooperatively monitor the harvest and population of black bear on Kuiu Island.

3.3.11.5 Spatial and Temporal Framework

Legacy trees remaining in a harvested stand using prescriptions that retain 50 percent of the stand basal area would result in a more natural forest setting and enhance both the vegetation and wildlife values. Some of the trees retained in the treated stand may eventually blow over and provide denning habitat for the bears that live in, or next to, the treated stands. Untreated stands surrounding the treated stand would also provide denning habitat for the black bear population.

Continued harvest within the project area and island-wide should maintain stands within the stand initiation stage of stand development, maintaining good high quality habitat and food throughout the rotation. Additionally, the silvicultural practices of thinning and pruning should maintain this habitat in quality condition throughout the rotation.

3.3.12 Alexander Archipelago Gray Wolf

The Alexander Archipelago wolf, a subspecies of the gray wolf, occurs on the Southeast Alaska mainland and on all large islands in Southeast Alaska except for Admiralty, Baranof, and Chichagof (Person et al. 1996). A wide-ranging, opportunistic predator, the wolf does not exhibit a preference for specific habitats or habitat characteristics. Wolf presence is more indicative of the availability of habitat for its primary prey species, Sitka black-tailed deer, rather than landform, climate, or vegetation (Suring 1993, Person et al. 1996). Person et al. (1996) examined the relationships between wolf viability, prey habitat capability, and hunter demand for deer. He concluded that maintaining an average long-term deer habitat capability of at least 18 deer per square mile over broad areas (using the current deer habitat capability model) should be sufficient to both provide for sustainable wolf populations and meet hunter demand for deer. Since wolves tend to have home ranges that cross several wildlife analysis areas, the appropriate scale at which this model should be applied is the biogeographic province (Tongass Land and Resource Management Plan Implementation Policy Clarification 1998 (TPIT)). The wolf secondarily preys upon beaver and moose, and when available, spawning salmon, and waterfowl (Person et al. 1996). Wolves on Kuiu Island consume deer, moose, black bear, mink, muskrats, marten, other rodents, waterfowl, fish, and grouse.

For the Kuiu Timber Sale project, the IDT evaluated the impacts to wolves on an island-wide basis (Kuiu Island Biogeographic Province). According to the deer winter habitat capability model, Kuiu Island theoretically has enough habitat to currently support 27 deer per square mile (Forest Plan FEIS Part 1, p. 3-379). Person et al. (1996) believes this is a sufficient prey density to support a sustainable wolf population and meet human deer harvest demands.

Availability of suitable denning habitat is of secondary importance to wolves. Dens are generally located in sites with good drainage and within 100 meters of fresh water (Person et al. 1996).

Ninety-four wolf pelts taken from WAA 5012 were turned into the Alaska Department of Fish and Game for sealing between 1990 and 2001 (Meucci 2002) with the annual average harvest over the last twenty years of five wolves. Refer to the Subsistence section of this chapter for a description of WAA 5012.

Dens

During the 2003 field season, field crews located a probable wolf den in the project area. The crew took photos and the crew leader conferred with Dave Person from ADF&G. The correct buffer was prescribed for the site. The site was revisited again during the 2004 and 2005 field seasons. This den was inactive in 2004 and 2005. During the 2004 field season, another den site was located in the project area. Following consultation with Dave Person, it was determined that it was probably a bear den. It was revisited during the 2005 field season and was unoccupied. Both areas had the prescribed 1,200-foot buffers following Forest Plan direction (Forest Plan p. 4-113).

Roads

The primary threat to wolf populations are high road densities and increased access by humans who kill wolves both legally and illegally by shooting, snaring, or trapping (Person et al. 1996, Person 2001). Wolves are reportedly intolerant of open road densities that exceed the 0.7-1.0 mile per square mile threshold, raising a concern of maintaining viable populations (Person et al. 1996, Person 2001, Forest Plan p. 4-116). Currently the road density for Kuiu Island is 0.20 miles per square mile. This project would not increase the road density; all action alternatives for this project propose to reduce open road density in the Kuiu Timber Sale Area. Refer to the Transportation section of this chapter and the Road Management Objectives in Appendix B of this EIS.

In a study conducted on Prince of Wales and Kosciusko Islands from 1992 to 1995, Person et al. (1996) found that WAAs with road density of 0.7 miles per square mile below 1,200 feet in elevation experiences a twofold increase in wolf mortality. The area was calculated using road density area within a WAA below 370 meters (~1,200 feet) elevation as the denominator. Wolves spend most of their time at low elevations and calculations of road density reflect this relation. In a concurrent radiotelemetry study, the average annual mortality was 50 percent of the population, which is not sustainable (Person et al. 1996).

When the road density exceeded 0.9 miles per square mile on a study area located on Prince of Wales Island, all resident wolves were harvested (Person et al. 1996).

Person (2001) also found that while wolves are susceptible to hunting and trapping from all roads there was a perceivable increase in wolf mortality from roads that were connected to communities. Kuiu Island roads do not connect to any community. The open road density in WAA 5012 is 0.42 mi/mi^2. The open road density on Kuiu Island is 0.2 mi/mi^2. Within the project area, open road density is currently 0.78 mi/mi^2; however, all action alternatives would reduce the road density to below 0.7 mi/mi^2. Table 3-26 displays open road density by alternative within the project area. The existing open road density is represented by Alternative 1.

Table 3 - 26. Road density by alternative in the Kuiu Timber Sale Area

Alternative	1	2	3	4	5
Open Road Density (mi/mi^2)	0.78	0.67	0.66	0.63	0.63

Conclusions

Effects would be minimized on National Forest System lands by: 1) using old growth reserves to protect key deer winter range, 2) using timber harvest treatments other than traditional clearcutting, and 3) monitoring and limiting open road density. Historically, a small number of wolves were harvested annually on Kuiu Island. Small wolf harvests are likely to continue on Kuiu Island due to the limited access during the trapping season. Only the eastern portion of the island is vulnerable to trapping from the beach. Hunting pressure is limited because the road system is not connected to the Alaska Marine Highway and while not impossible, it is difficult to transfer a vehicle to the road system. Therefore, an increase in trapping pressure is not anticipated on Kuiu Island because of limited access, and the absence of permanent logging camps or communities.

3.3.13 1 Effects Common to All Alternatives

Biodiversity

Implementation of the proposed changes for small old-growth habitat reserves in VCUs 398, 399, and 402 is compatible with all action alternatives and would increase connectivity and improve habitat within the reserves.

Black Bear

Black bear range throughout all habitat types found within the project area. Mature and old growth timber provides denning and bedding sites. A negative impact to bears may occur through the loss of old-growth habitat, fragmentation, and increased road density. The increase in acres of early successional habitat created by clearcut harvests would provide quality foraging sites for a short time, particularly during spring and summer seasons.

Alexander Archipelago Wolf

The Alexander Archipelago wolf ranges through all habitat types found within the project area. The wolf is closely linked to populations of the Sitka black-tailed deer, its primary prey species, and declines in deer habitat would negatively affect wolf populations. The island-wide deer density would remain above 18 deer per square mile after harvest in all alternatives. The resulting deer density is sufficient to support a viable wolf population and meet hunters' demands. Wolves experience higher mortality from hunting and trapping in WAAs with high road densities (Person 1996). Open road densities below 1,200 feet in elevation within WAA 5012 are 0.42 miles per square mile, well below the 0.7 mile per square mile density.

The action alternatives would re-open between 3.2 and 6.9 miles of roads that are currently closed (in a storage condition) and would construct between 2.9 and 19 miles of temporary roads. These roads would be re-opened for a short time and would be returned to storage once the harvest is complete. The alternatives would also close between 8.2 and 11 miles of currently open roads. All roads re-opened or constructed during this project would be closed (put into storage or decommissioned) following harvest activities. These activities would not cause a direct or cumulative effect to wolf populations on Kuiu Island because of the use patterns of humans. Currently, open road density in the project area is 0.78 mi/mi^2. All action alternatives would reduce road density to below 0.7 mi/mi^2. For more information on roads, please refer to the Transportation section of this chapter.

3.3.14 Comparison of Effects by Alternative

Deer, black bears, and wolves would be affected in different ways depending on the amount and type of timber harvest and road construction. The following is a comparison of the effects of each alternative on these species.

3.3.14.1 Alternative 1

This alternative proposes no new activities in the Kuiu Timber Sale Area. Wildlife habitat may decline in current second-growth stands as they regenerate and the understory forage is shaded. There would be no change in the current road network.

Habitat capability for deer has been reduced by 31 percent since 1954 in the project area. No additional acres of deer habitat would be harvested by this alternative. When harvested areas regenerate to the point of stem exclusion, thinning or pruning could be applied to increase forage productivity.

Marten habitat capability has been reduced by 23 percent since 1954 in the project area. No addition reductions would be expected with this alternative.

3.3.14.2 Alternative 2

Alternative 2 proposes harvest on 491 acres. Harvest prescriptions include 294 acres of partial harvest with 50 percent basal area retention and 197 acres of clearcut. Approximately 2.9 miles of new temporary roads would be constructed, and decommissioned after timber harvest. Approximately 4.5 miles of roads currently in storage would be reopened and 8.2 miles of currently open roads would be put into storage.

Of the low elevation POG deer habitat harvested by this alternative, 151 acres would be harvested using the uneven-aged prescriptions. An additional 96 acres of low elevation habitat would be harvested using the clearcut prescription. A total of 228 acres of volume class 6 and 7 (coarse canopy habitat) would be harvested. According to deer model predictions, deer habitat capability may be reduced by two percent following harvest.

High value deer winter habitat and deer habitat capability would be reduced by two percent from the current conditions.

High value marten habitat acres would be reduced by two percent and marten habitat capability would be reduced by less than one percent from the current level.

Deer, wolf and bear would unlikely be adversely affected by this alternative since 294 acres (60 percent of the acres harvested) are in partial harvest prescriptions that retain 50 percent of the basal area which would help maintain a natural forest mosaic. Bear would

initially thrive due to the increased forage produced by the proposed prescriptions. When harvested areas regenerate to the point of stem exclusion, thinning or pruning could be applied to maintain forage productivity. Road closures would reduce hunter accessibility. The deer model reports all units as harvested by an even-aged prescription so the results would be even less with a 50 percent retention prescription.

3.3.14.3 Alternative

Alternative 3 proposes harvest on 794 acres. Harvest prescriptions include 385 acres partial harvest with 50 percent basal area retention and 409 acres clearcut harvest. Approximately 7.5 miles of new temporary roads would be constructed and decommissioned after harvest. Approximately 3.2 miles of roads currently in storage would be reopened. These roads would be put into storage after timber harvest. Approximately 8.4 miles of currently open roads would be put into storage.

Of the low elevation POG deer habitat harvested by this alternative, 146 acres would be harvested using the 50 percent basal area retention harvest prescriptions. An additional 90 acres would be harvested using the clearcut prescription. Approximately 334 aces of coarse canopy (volume class 6 and 7) would be harvested.

High value marten habitat would be reduced by three percent and marten habitat capability would be reduced by two percent from the current condition within the project area.

High value deer habitat would be reduced by two percent and deer habitat capability would be reduced by three percent from the current conditions within the project area.

Deer, wolf and bear populations are not likely to be adversely affected by this alternative since applied harvest prescriptions would result in a large number of uneven aged stands which should help maintain a natural forest mosaic. Bear would initially thrive due to the increased forage produced by the proposed prescriptions. When harvested areas regenerate to the point of stem exclusion, thinning or pruning could be applied to maintain forage productivity. Road closures may reduce hunter accessibility.

3.3.14.4 Alternative 4

Alternative 4 proposes harvest on 1,425 acres. Harvest prescriptions include 399 acres partial harvest with 50 percent basal area retention and 1,026 acres clearcut. Approximately 19 miles of new temporary roads would be constructed and decommissioned after harvest. Approximately 6.1 miles of roads currently in storage would be reopened and 11 miles of currently open roads would be put into

storage. All of these roads would be put into storage after timber harvest.

Of the low elevation deer habitat harvested by this alternative, 141 acres would be harvested using the uneven-aged prescriptions, and 341 acres would be harvested using the clearcut prescription. Approximately 813 acres of coarse canopy (volume class 6 and 7) would be harvested.

High value marten habitat would be reduced by six percent and marten habitat capability would be reduced by four percent from the current conditions within the project area.

High value deer habitat would be reduced by five percent and deer habitat capability would be reduced by four percent from the current conditions within the project area.

Deer, wolf and bear populations are not likely to be adversely affected by this alternative since applied harvest prescriptions would result in a large number of uneven-aged stands which should help maintain a natural forest mosaic. When harvested areas regenerate to the point of stem exclusion, thinning and pruning could be applied to maintain forage productivity.

3.3.14.5 Alternative 5

Alternative 5 proposes harvest on 1,231 acres all of which would be clearcut harvested. Approximately 17.1 miles of new temporary roads would be constructed, and decommissioned after harvest. Approximately 6.9 miles of roads currently in storage would be re-opened and 11 miles of currently open roads would be put into storage.

High value marten habitat would be reduced by five percent and marten habitat capability would be reduced by four percent from the current condition within the project area.

High value deer habitat and deer habitat capability would be reduced by four percent from the current conditions within the project area.

Approximately 446 acres of low elevation deer habitat would be clearcut harvested by this alternative. Approximately 553 acres of coarse canopy (volume class 6 and 7) would be harvested.

Deer, wolf and bear populations are not likely to be adversely affected by this alternative since applied harvest prescriptions would result in a large number of uneven aged stands which should help maintain a natural forest mosaic. Bear would initially thrive due to the increased forage produced by the proposed prescriptions. When harvested areas regenerate to the point of stem exclusion, thinning and pruning could be applied to maintain forage productivity.

3.3.15 Cumulative Effects

3.3.15.1 Past, Present, and Reasonably Foreseeable Future

Timber harvest has occurred on much of the northern portion of the island. This harvest was mostly to fill the needs of the long-term sale program starting in 1954. Kuiu Island was an alternate area for the Alaska Pulp Corporation long-term sale. Most of these units have been treated once with silvicultural thinning. Wildlife would benefit from the thinning and/or pruning treatment to approximately 1,475 acres of 37-year-old second growth stands within the Saginaw Watershed. The IDT has visited these units and has determined that it would be beneficial to prescribe treatments to extend the usefulness of the deer and bear habitat. The judicious use of silvicultural treatments (thinning and pruning) can extend the time animals can use these habitats and thus maintain animal populations.

Past management activities within WAA 5012 has reduced POG habitat by 19 percent. The Forest Plan predicts that 54 percent of the 1954 POG habitat will remain at the end of the rotation in WAA 5012 (Forest Plan, FEIS p. 3-387). Analysis shows the Kuiu project area is well within this predicted decline.

Deer

Past management activities have reduced deer habitat capability in WAA 5012 by 22 percent and in the project area by 31 percent compared to historic conditions. At the most the action alternatives would reduce deer habitat capability in the project area by an additional four percent (Alternatives 4 and 5) and one percent in WAA 5012. After harvest of Alternative 4 (the worst case scenario) 77 percent of the deer habitat capability would be retained. The Forest Plan predicts that 56 percent of the deer habitat capability would remain at the end of the rotation (2095) (Forest Plan FEIS Part 1, p. 3-373) in WAA 5012. These changes assume all harvest is even-aged. The results should be somewhat less for Alternatives 2, 3, and 4 because of the particle harvest prescriptions proposed for this EIS.

Past management activities have reduced high value deer habitat in WAA 5012 by 39 percent since 1954 and by 49 percent in the project area.

Marten

Other timber harvests planned on Kuiu Island in the near future may further decrease marten habitat capability. Cumulative effects would be minimized on National Forest System lands by: 1) implementing old-growth reserves with connectivity, 2) using timber harvest treatments other than traditional clearcutting, and 3) monitoring and limiting open road density.

Marten habitat capability within the project area has declined 23 percent since 1954. There would be an additional reduction of one to three percent depending on the alternative selected.

High value marten habitat has been reduced by 29 percent in WAA 5012 and by 34 percent within the project area. An additional reduction of two to six percent would occur within the project area with the implementation of the action alternatives, depending on the alternative selected.

The Forest Plan FEIS (pp. 3-398 - 3-399) predicts there is a relatively high likelihood of sustaining viable marten populations when an average of 57 percent of the productive old-growth (POG) is retained within the matrix of development LUDs. Other factors contributing to this likelihood include riparian management, the old-growth habitat reserve system, and use of two-aged management and uneven-aged management within high value marten habitat. Currently 72 percent of the POG has been retained within the matrix within the project area. Adoption of the design changes to the small OGRs within VCUs 398, 399, and 402 would improve the habitat within these reserve systems.

Black Bear

Fragmenting a continuous forested habitat by clearcutting has the potential to increase bear populations by creating foraging areas with abundant preferred foods (Erickson et al. 1982). This increased food supply on any given clearcut is short-lived, however. Canopy closure during the stem exclusion stage occurs at age 15 to 25 years (Oliver and Larson 1996). At this time forage production is lowest, and may cause black bear populations to decline. The judicious use of silvicultural practices such as thinning and pruning can increase the productive time that harvest units provide suitable habitat for black bear by maintaining the understory in these stands while allowing the trees to grow larger and the understory species to flourish. Alternative harvest regimes may provide adequate habitat to black bear without the closure described during the stem exclusion stage of stand development. However, if these maturing stands remain untreated and they follow the natural stand stage development, the habitat will decrease in value over time through plant succession. Prescribed silvicultural treatments are available to maintain the habitat value for black bear and other species through time.

Future Projects

For the Kuiu Timber Sale action alternatives, an individual timber offering in 2006 or more than one sale over a period of several years starting in 2006 may occur. Road construction and harvest of an action alternative would be completed approximately three to four years later.

It is reasonable to assume that timber harvest and associated road management will continue on Kuiu Island. The current Tongass timber sale schedule lists other timber sale projects:

- Crane and Rowan Mountain Timber Sales FEIS signed June 1998. Portions of the selected alternative have been harvested. Approximately 23 mmbf were returned to the Tongass National Forest and may be offered for sale at a later date.
- Threemile Timber Sale FEIS was signed April 2004. The Threemile Timber Sale will harvest approximately 19.5 mmbf on approximately 665 acres and construct 4.2 miles of new classified roads and 4.2 miles of temporary roads.
- Bayport is a 25 mmbf timber sale scheduled for planning to begin in 2010.

3.3.16 Migratory Birds

3.3.16.1 Introduction

The Migratory Bird Treaty Act is the domestic law that affirms, or implements, the United States' commitment to four bilateral international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource. Each of the conventions protect selected species of birds that are common to both countries (i.e., they occur in both countries at some point during their annual life cycle). The list of migratory bird species protected under these treaties is filed in the project planning record (USDI Fish and Wildlife Service 2004).

3.3.16.2 Existing condition

Executive Order 13186 of January 10, 2001, directs federal agencies to evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern. A report entitled "Neo-tropical Birds of Concern on the Tongass National Forest – Kuiu Timber Sale Area" is filed in the project planning record. The report includes a discussion of 40 protected migratory bird species that may occur on the Tongass National Forest, and any anticipated effects to these species from the proposed activities for this project. The report concludes that proposed activities for this project are not expected to result in measurable negative effects to any migratory bird populations for the following reasons:

- Eighteen of the migratory bird species considered important on the Tongass National Forest do not occur in habitats where forest management activities would likely take place. These habitats are either not impacted by management activities such as logging and road building, or are protected by Forest Plan land use designations.

- Two migratory bird species are extremely rare on the Tongass National Forest but their habitat may be impacted by management activities. These species are associated with riparian shrub and alder thickets. No timber harvest in this habitat type is proposed for this project.
- Eight migratory bird species are uncommon on the Tongass National Forest but could be disturbed by management activities on the Tongass National Forest. Forest Plan standards and guidelines and LUD allocations should protect sufficient habitat for these species.
- Twelve species are common or abundant within habitats where forest management activities may take place. Potential disturbances may occur to their habitat, but Forest Plan standards and guidelines and LUD allocations should protect sufficient habitat for these species.

3.3.16.3 Cumulative Effects

Some direct effects to nesting birds will occur in all of the action alternatives. The primary effect will be loss of habitat, nest destruction, or abandonment. The magnitude of the effects will vary depending upon the alternatives selected and in which season harvest occurs. Nesting in Southeast Alaska generally begins in May. By September, the birds are fledged and will not be directly affected.

Indirect effects would be associated with fragmentation and patch size reduction of suitable habitat. For species such as northern goshawk, marbled murrelet, and Townsend's warbler, habitat removal would affect forest fragmentation by potentially reducing the effectiveness of interior habitat and increasing the potential for nest-site predation from avian predators that are associated with forest edges and fragmented landscapes. The Old-growth habitat reserve system was designed to maintain large areas of habitat for these species. That, in combination with the management of the matrix within the lands open to harvest, will mitigate many of the effects of harvest on neotropical migratory birds. Other species may be more associated with forest edge, riparian or more open habitats; therefore, the effects from timber harvest could be beneficial to other bird species. We may affect certain individual birds but the design of the alternatives in conjunction with the management of the matrix and the old-growth habitat reserves will meet the requirements of habitat for these bird species and maintain them within the Tongass National Forest.

3.3.17 Subsistence

3.3.17.1 Introduction

With the passage of the Alaska National Interest Lands Conservation Act (ANILCA), the U.S. Congress recognized the importance of subsistence resource gathering to the rural communities of Alaska. ANILCA (16 USC 31130) 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 byproducts of fish and wildlife resources taken for personal or family consumption; and for customary trade."

ANILCA provides for the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives, on public lands. It also set legislation that customary and traditional subsistence uses of renewable resources shall be the priority consumptive uses of all such resources on the public lands of Alaska. Non-rural residents are not provided a preference for the taking of fish and wildlife on public lands. Juneau and Ketchikan are the only communities in Southeast Alaska that have been determined to be non-rural by ANILCA and the Federal Subsistence Board.

3.3.18 Community Subsistence Profiles

Kake residents probably use the project area more than residents of any other community in Southeast Alaska. They fish, hunt deer and waterfowl, gather seaweed, medicinal plants, shellfish, and berries. Petersburg and Wrangell residents make limited use of the project area for hunting deer and commercial fishing. Other nearby rural communities with some reported fish and wildlife gathering activities in the project area include Port Protection, Point Baker, Port Alexander, and Meyers Chuck.

3.3.18.1 Kake

Kake is located on the northwestern tip of Kupreanof Island. It is approximately 105 air miles from Juneau, 40 air miles from Petersburg, and approximately 12 air miles northeast of the Kuiu Timber Sale Area. In 1990 and 2000, the population of Kake was reportedly 700 and 710, respectively. Approximately 74.6 percent of the population is Native American (U.S. Census 1990 and 2000). By 2003 the population had fallen to 682, which was a drop of two percent from the 1995 population of 696 (Matson 2004).

Kake is a long established community whose residents have a lengthy history of hunting, fishing, and gathering wild foods. In recent years, intensive timber management has taken place on Native Corporation and National Forest System lands adjacent to Kake.

The community of Kake has a variety of income sources. Governments (state, federal, and local) contribute about 70 percent of earned income in households surveyed (Firman and Bosworth 1990).

Retail and private businesses provide income for 21 percent of the households. The timber industry supplies jobs, as do the commercial fishing and processing industries.

Kake residents harvest a variety of subsistence resources, documented in detail through the Tongass Resource Use Cooperative Study (TRUCS) (Kruse and Frazer 1988). Households in Kake reported they consume an average of 160 pounds of meat and fish annually. The subsistence resources most often used are salmon, other finfish, and deer. In terms of pounds of edible harvest, fish constituted 48 percent of the 1996 total harvest (24 percent salmon, 24 percent other fish), large mammals 29 percent, marine invertebrates 12 percent, plants five percent, and birds less than one percent.

There is a long history of use of the waters near the project area by Kake residents. The saltwater is heavily used by commercial, sport, and subsistence users. The stream locally known as Fall Dog Creek is adjacent to the project area and is heavily used by Kake residents for subsistence fishing and gathering when they are traveling to Bay of Pillars. Most of the large streams on Kuiu Island are used by Kake residents, especially in the Rocky Pass area because of its easy access, even in inclement weather. These areas are used for hunting, fishing, and gathering seaweed.

3.3.18.2 Point Baker and Port Protection

Point Baker and Port Protection are on the northwest end of Prince of Wales Island, approximately 40 miles southeast of the project area. The 1990 census reported a population of 39 in Point Baker and 62 in Port Protection. In 2000, the U. S. Census reported 35 people living in Point Baker and 63 in Port Protection. By 2003 the population of Point Baker had fallen to 33, which was a drop of 47 percent from the 1995 population of 62 (Matson 2004). By 2003 the population of Port Protection had dropped to 57, which was a drop of 11 percent from the 1995 population of 64 (Matson 2004). Less than one percent of the populations of both communities combined are Native American. Employment in both communities is seasonal, based on commercial fishing. Residents of both communities use the project area for deer hunting and fishing.

Port Protection and Point Baker residents harvest a variety of subsistence resources, documented in more detail through the TRUCS of 1988. In terms of edible harvest, fish constituted 45 percent of the 1987 total harvest, deer 35 percent; invertebrates 10 percent, mammals other than deer 0.2 percent, plants 2.8 percent and birds 0.4 percent.

Residents of Port Protection and Point Baker use the southern portion of Kuiu Island and the lower reaches of Keku Strait. These areas are used for hunting, fishing, and gathering plants and berries.

3.3.18.3 Petersburg

Petersburg is situated on the northwest shore of Mitkof Island at the north end of Wrangell Narrows, approximately 35 miles southeast of the Kuiu Timber Sale Area. The 1990 census population of Petersburg was 3,207 people and the 2000 census population was 3,224. By 2003 the population had fallen to 3,060, which was a drop of 9 percent from the 1995 population of 3,350 (Matson 2004).

Except for a slight decline in the 1950s, a continual growth in population has occurred. Approximately 10 percent of the population is Native American. Prior to white settlement, Native Americans used the Petersburg area for seasonal fishing camps. Founded by Norwegian Peter Buschmann in 1899, Petersburg was incorporated in 1906. More Norwegians followed and created a Scandinavian-style community. Petersburg grew around a cannery, and the site quickly became a center for fishing, fish processing, and transportation.

Petersburg's economy is highly dependent on seafood harvesting and processing. A number of fish, shrimp, and crab canneries have operated in Petersburg and nearby Scow Bay over the years. Petersburg is homeport to the largest salmon purse seining fleet in Southeast Alaska. Halibut has also been central to the local fishing industry because it provided regular employment through the winter months. Approximately 37 percent of the households fished commercially in 1987, and 12 percent of all fish used by households came from commercial catches (ADF&G 1994 [revised 1999]).

Government institutions, particularly local government, became the second largest employment sector in the Petersburg economy in the 1980s. Other economic sectors include retail trade, construction, timber, and tourism. Large-scale logging was introduced to the area in the 1960s but has subsequently declined with the end of the long-term timber contracts in the 1990s.

The subsistence resources most commonly used by Petersburg residents are coho and chinook salmon, halibut, and deer. Crab, shrimp, berries, and wood are also important. Subsistence harvest provides just over 30 percent of the meat and fish for Petersburg residents (Kruse and Muth 1990). Petersburg residents harvest most of their fish well away from the project area. Those that do use the area do so when involved in commercial fishing activities.

3.3.18.4 Wrangell

Wrangell is on the northern tip of Wrangell Island, approximately 60 miles east of the Kuiu Timber Sale Area. In 1990, the U. S. census reported the population of Wrangell as 2,479 people and the 2000 census population was 2,308 people. By 2003 the population had fallen to 2,113, which was a drop of 23 percent from the 1995 population of 2,758 (Matson 2004). Approximately 20 percent of the population is Native American.

The community began as an important Tlingit village primarily because of its proximity to the Stikine River. Wrangell Stikine Kwan clans held and fiercely defended a monopoly of trading rights along the Stikine River, which served as an important early trade route into the Canadian interior. The flags of three nations (England, Russia, and the United States) have flown over Wrangell. Wrangell became a supply center for gold miners and prospectors during a gold rush in 1862 and in the Klondike rush of the 1890s. Over the years, several fish, crab, and shrimp canneries have operated near Wrangell (ADF&G 1994 [revised 1999]).

Timber, fishing, and fish processing dominate Wrangell's economy. Approximately 19 percent of Wrangell households fished commercially in 1987. Commercial fishing contributes significantly to the subsistence fish harvest. Approximately 16 percent of all fish used by households in 1987 came from commercial catches (ADF&G 1994 [revised 1999]). Tourism has been a growing economic sector in recent years.

Wrangell residents make limited use of the project area for deer and bear hunting and for sport fishing.

3.3.18.5 Other Communities

Meyers Chuck is a small community that has some reported subsistence use in the project area. Meyers Chuck is located on the Cleveland Peninsula approximately 80 miles to the southeast of Kuiu Island. Most of this use is from commercial fishermen and is an incidental use in nature. By 2003 the population had fallen to 18, which was a drop of 49 percent from the 1995 population of 35 (Matson 2004).

3.3.19 Types and Amounts of Resources Gathered

Summary subsistence harvest information is presented in Table 3-27. This table displays the total harvest of terrestrial game species from Kuiu Island for regulatory years 1984-2003. Before 1991, Kuiu Island was closed for deer hunting. Most of the subsistence harvest on Kuiu Island was by Petersburg and Kake residents. The Sitka black-tailed deer is by far the most important species listed in this table. Black bear and moose are also important resources, although not as important as deer. Trapping, especially for marten and less so for beaver, is a

potentially significant subsistence activity that occurs in the project area. When compared to the number of animals harvested from Mitkof, Kupreanof, and Admiralty Islands, the numbers harvested from Kuiu Island are relatively small and variable. Local patterns are discussed briefly below. The primary subsistence resource of potential concern is deer, which will be discussed in more detail.

3.3.20 Wildlife Effects and Evaluation

3.3.20.1 Abundance and Distribution of Deer

The evaluation of deer is based on a comparison of supply and demand. The deer habitat capability model developed as part of the Forest Plan was used in this analysis to provide an estimate of the potential number of deer that the habitat within a Wildlife Analysis Area (WAA) can support over time. This is the potential supply available for subsistence use. If the demand for deer exceeds the supply, then a significant possibility of a subsistence restriction exists.

Deer have been an important subsistence resource since Southeast Alaska was settled. As motorboats and larger commercial fishing boats became more common, the hunting ranges expanded. Most deer were hunted close to shore or a short distance inland, although some people did hunt the foothills, side-hills, and mountaintops (especially when deer were relatively scarce).

Prior to the 1970s, Kuiu Island had three-month to five-month long deer hunting seasons with bag limits of up to three or four deer. The winters in 1971 and 1972 were extremely severe. As a result, the deer population crashed and the hunting season was closed from 1975 to 1991. Since 1992 most of Kuiu Island has been open with a two-buck bag limit.

On Kuiu Island, the use of WAA 5012 is limited and variable. In past years, Petersburg and Kake residents heavily hunted Kuiu Island for deer. Following the deer die-off in the early 1970s, hunters shifted to Admiralty Island (especially WAAs 3938-3940) and, to a lesser extent, the northern part of Prince of Wales Island, as well as on the nearby mainland. When hunting was again allowed, the low number of deer and their availability did not persuade hunters to return to Kuiu Island to hunt. The deer population is growing, but it is not advantageous at this time for most hunters, who have to travel long distances to hunt on Kuiu Island. Hunters generally go to Admiralty Island where the deer population is higher and therefore much easier to hunt successfully.

Subsistence use areas and the levels of harvest were estimated from a variety of sources. The ADF&G records the level of community harvests for selected species, including deer, within WAAs. Kuiu Island has five WAAs. The project area is in WAA 5012.

Data compiled from the Alaska Department of Fish and Game's (ADF&G) Deer Hunter Surveys is shown in Table 3-28. The average number of deer harvested on Kuiu Island since 1993, when the season reopened, is 18.4 with a range of 7 to 29 animals harvested. In contrast, the average for Kupreanof is 174 with a range of 90 to 373. Mitkof Island, the average is 139 with a range of 64 to 232 during the same period.

Table 3 - 27. Subsistence harvest of important game species on Kuiu Island

Year	Beaver	Otter	Wolf	Wolverine	Deer	Marten	Black Bear	Moose
1984	17	40	0	0	N/A*	N/A	51	N/A
1985	18	19	4	0	N/A	N/A	66	N/A
1986	14	5	1	0	N/A	N/A	89	N/A
1987	9	3	4	0	N/A	N/A	84	N/A
1988	11	3	3	0	N/A	N/A	118	N/A
1989	2	0	3	0	N/A	N/A	109	N/A
1990	0	0	0	1	N/A	N/A	78	N/A
1991	6	0	7	0	N/A	N/A	77	1
1992	8	0	3	0	N/A	N/A	88	0
1993	0	11	16	0	11	23	121	0
1994	9	9	1	0	24	0	111	0
1995	0	7	8	0	25	51	124	0
1996	0	6	9	0	22	21	131	0
1997	0	7	5	0	13	35	165	0
1998	0	0	8	0	29	15	161	0
1999	0	0	10	0	18	0	168	0
2000	1	0	7	0	27	17	166	0
2001	0	0	3	0	8	0	105	0
2002	0	0	13	0	17	0	112	1
2003	0	0	4	0	7	10	121	0
2004	0	0	0	0	N/A	0	114	0
Average	**4**	**5**	**5**	**<1**	**19**	**14**	**112**	**<1**

N/A = Harvest records were not available.
Source: Meucci 2005

Table 3 - 28. ADF&G deer hunter survey results for Kuiu Island

Year	No. of hunters	No. of successful hunters	No. of days hunted	No. of bucks harvested	No. of does harvested	Total deer harvested	Ave. no. of deer per hunter	Average days per deer
1993	19	8	33	11	0	11	0.6	3.0
1994	26	13	50	24	0	24	0.9	2.1
1995	28	22	87	20	5	25	0.9	3.5
1996	NR	18	NR	22	0	22	1.2	NR
1997	39	13	141	13	0	13	0.3	10.8
1998	41	19	212	29	0	29	0.7	7.3
1999	57	14	102	18	0	18	0.3	5.7
2000	42	27	157	27	0	27	0.6	5.8
2001	17	8	21	8	0	8	0.5	2.6
2002	35	13	143	17	0	17	0.5	8.4
2003	23	7	63	7	0	7	0.3	9.0
Average	**29.7**	**14.7**	**91.7**	**17.8**	**0.5**	**18.4**	**0.6**	**5.3**

NR = data not reported

Effects of the Alternatives for WAA 5012

The Wildlife Habitat section of this chapter describes the deer habitat capability model used to estimate the effects of the proposed timber harvest on deer habitat. For this subsistence evaluation, the deer habitat capability for WAA 5012 is reduced 36 percent to account for predation by wolves. This represents the theoretical maximum number of deer available for hunters that the area could support over time.

The Alaska Department of Fish and Game has set deer population objectives for all Wildlife Analysis Areas on the Tongass National Forest. The population objective set by the State of Alaska for WAA 5012 is 5,390 animals. ADF&G also estimated hunter demand for deer in WAA 5012 to be 68 deer, based on estimated annual harvest during the years 1960-1968. To sustain a healthy deer population, harvest should not exceed ten percent of the deer population in any WAA (Forest Plan FEIS, Page 3-361). Therefore, a minimum number of deer needed to meet the hunter demand of the 1960s would be 680 deer. This is well within the capability of the WAA and is therefore considered a sustainable harvest. Based on this number, and on the

model predictions described above, WAA 5012 has the habitat capability to support a deer population sufficient to meet the State of Alaska's population objectives at this time.

All action alternatives would result in reductions of deer habitat capability. Alternatives 2 and 3 would result in less than one percent decline in deer habitat capability. Alternatives 4 and 5 would result in a one percent decline in deer habitat capability in WAA 5012 (Table 3-29).

All alternatives would result in an immediate decline in habitat capability. Further declines are modeled to occur 26 years after harvest when the stem exclusion stage is reached. Future thinning in roughly 10 to 20 years may maintain understory forage and could mitigate the decline in potential deer habitat. The Tongass National Forest has had an active and continuous timber stand improvement program for over 25 years. These vegetative treatments maintain understory vegetation. There is no indication that this program will be discontinued or that forest health and wildlife habitat management will cease on the Tongass National Forest.

Table 3-29. Deer habitat capability for WAA 5012 by alternative

	1954	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Estimated number of animals [a]	8,535	6,641	6,614	6,606	6,569	6,581
36 % reduction[b]	5,462	4,250	4,233	4,228	4,204	4,212
% Change from current condition			<1%	<1%	1%	1%

[a] The deer model assumes that an area with an HSI score of 1.0 could support 100 deer per square mile.

[b] In accordance with current Forest direction (Cole 2005), HSI scores have been reduced 36 percent to account for the effects of wolf predation.

3.3.20.2 Abundance and Distribution of Moose

Studies at Thomas Bay have shown that moose use may temporarily increase three-fold in clearcuts, but will likely decline to low levels if forage is eventually shaded out by conifer regeneration (Doerr 1998). In all harvest alternatives, moose are likely to benefit from an increase in understory from the proposed cutting. The long-term effects of this logging activity would depend on whether thinning and other silvicultural treatments would be used to maintain understory in the harvested areas. One of the future concerns is maintaining understory in the existing second-growth stands. Numerous thinning needs were identified for second-growth stands on National Forest System lands within the Kuiu Timber Sale Area. At this time, stands harvested earlier than 1968 may be thinned or pruned to benefit wildlife species including moose.

3.3.20.3 Abundance and Distribution of Black Bear

The black bear is an important subsistence animal in Southeast Alaska. In ADF&G's Game Management Unit (GMU) 3, where Kuiu Island is located, the bear is becoming more important not only to resident hunters but to non-resident hunters as well. There is concern about the Kuiu Island black bear population and what will happen if timber harvest continues on this island at its projected rate. Outfitter/Guides are now advertising their hunts on Kuiu Island as a "World Class Trophy Hunt" and are able to command higher prices because of the large bear population and the large size of the individual animals.

Concern expressed over the increasing harvest of black bear on Kuiu Island, especially through outfitted and guided hunting, has led ADF&G to reduce the black bear harvest on Kuiu Island to 120 animals annually for non-resident hunters. All rural residents of Alaska have subsistence rights on Kuiu Island, and the remainder of GMU 3, for black bear harvest.

Field observations indicate that black bear are common and well distributed within the Kuiu Timber Sale Area. ADF&G studied black bear populations on Kuiu Island and found that the population is about 1.5 bears per square kilometer (Peacock 2004), which is one of the highest population levels of black bear ever recorded in North America. None of the alternatives are expected to result in any restrictions to subsistence harvest of black bear.

3.3.20.4 Abundance and Distribution of Furbearers

Marten are an important furbearer representing species associated with upland forested old-growth (forests with large snags and downed logs for dens and prey habitat). They are sensitive to human access. The type of harvest proposed varies among alternatives (Table 3-66 in the Timber and Vegetation section of this chapter) with more partial harvest within units with high value marten habitat in Alternatives 2 and 3, some partial harvest within units with high value marten habitat in Alternative 4, and no partial harvest within units with high value marten habitat in Alternative 5. See the Management Indicator Species section of this chapter for more information on harvest within units of high value marten habitat.

Table 3 – 30. Acres of marten habitat in the Kuiu Timber Sale Area by alternative

HSI		1954	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
0.01-0.29	Low	7,700	18,032	18,025	18,020	17,989	17,989
0.30-0.49	Medium	2,326	2,326	2,308	2,306	2,296	2,296
0.50-0.80	High	5,933	5,933	5,870	5,802	5,757	5,713
0.90-1.00	Highest	30,110	19,778	19.378	19,146	18,602	18,823
Total*		**46,069**	**46,069**	**45,581**	**45,274**	**44,644**	**44,821**

* Totals for alternatives vary because acres harvested become a 0 HSI value.

Most trapping activity occurs near the beach using boats to access the area. Approximately one-third of the island is roaded and the population in that area may be trapped, snow conditions permitting, by local trappers from Kake.

According to the sealing records from ADF&G (Table 3-27), marten trapping has been recorded on Kuiu Island since 1993. During this period, an average of 14 marten has been taken annually. The most animals were harvested in 1995, with 51 marten trapped. No marten were reported trapped in 1994, 1999, 2001, 2002, or 2004.

Past subsistence hearings have indicated that most marten trapping is by local area residents. Very few people travel to Kuiu Island to hunt or trap from other communities in Southeast Alaska.

No significant subsistence restrictions on marten are anticipated from any action alternatives. The miles of roads maintained for motorized public would remain the same in Alternative 1, and open road densities would be reduced after timber harvest by a minimum of 8.2 miles and a maximum of 11 miles depending on the alternative (Table 3-26).

3.3.20.5 Access to Wildlife

The primary modes of access for harvesting wildlife include boats, foot travel, cars, and all-terrain vehicles. Because the existing road system on Kuiu Island does not connect directly to any other road systems or the Alaska State Ferry System, only minimal impacts due to road use are expected.

Access by boat and foot would not be restricted by any of the action alternatives. Access to areas along the beach fringe would not change. Proposed road management objectives would keep motorized access below its current levels. All new temporary roads would be closed to vehicle traffic after timber harvest is complete in all action alternatives.

The action alternatives would re-open between 3.2 and 6.9 miles of roads currently closed (in a storage condition) and would construct between 2.9 and 19 miles of temporary roads. They would additionally close between 8.2 and 11 miles of currently open roads. All roads opened or constructed during this project would be closed (put into storage or decommissioned) following harvest activities with all structures removed. For more information, please see the Transportation Section in this chapter. Table 3-26 shows the road densities within the project area after harvest.

Most of the former temporary roads in the project area were decommissioned after their use was terminated. Decommissioned roads have signs of removed structures, intact water bars, and are generally brushed-in with alder. There is no evidence of ATV use on any of the decommissioned roads, mainly due to the remoteness of Kuiu Island. Most personal vehicle use on the island is in the form of pickup trucks, which cannot navigate the alder or the mound and pit type barriers normally found on decommissioned roads. Foot trails along the decommissioned roads are common; most of these are actively used as bear trails.

3.3.20.6 Competition for Wildlife

Competition is closely linked to access. Access within the project area is not expected to change greatly as a result of this project.

While there are approximately 56 miles of open roads in the Kuiu Timber Sale area, most competition comes from beach access, as roads are not the most common mode of transportation used by hunters.

Most hunting of black bear is from non-resident guided or transported hunters. The use of this resource by subsistence users has remained relatively stable at about 112 animals harvested per year.

Most furbearer trapping comes during the winter months and is done from a boat. Kuiu Island is remote and few trappers are able to reach it

reliably during the trapping season. There is no longer a year round logging camp and much of the recreational trapping that occurred when this camp was occupied has stopped.

Few deer and moose are harvested on Kuiu Island. Deer hunters prefer to go to islands that have larger populations, higher success rates, and higher bag limits. None of the action alternatives should have any effect on competition between rural and non-rural residents since none of the alternatives would change the existing access patterns to other communities. Potential conflicts among user groups for subsistence resources would not vary by alternative.

3.3.21 Fish and Shellfish Effects and Evaluation

3.3.21.1 Abundance and Distribution of Fish and Shellfish

Application of Forest Plan riparian standards and guidelines and road construction Best Management Practices (BMPs) would be expected to minimize the risk of impact to fish habitat and fish populations. Stream buffers are specified for all proposed harvest units. Refer to the unit cards in Appendix B of this EIS for descriptions of stream buffers and water quality BMPs. All action alternatives would result in temporary road crossings across fish streams. Refer to the Fisheries section of this chapter for additional information on stream crossings proposed for this project. The effects to fish populations from these proposed activities should be minor.

There are no expected measurable effects on shellfish populations for all action alternatives. With the exception of use of either the Saginaw Bay or Rowan Bay LTF, all proposed activities are located in the uplands, away from shellfish populations. Use of either LTF would present the greatest potential for adverse impacts to shellfish, but mitigation measures specified in the permits for the LTF should reduce these potential effects.

3.3.21.2 Access to Fish and Shellfish

Temporary road construction and reconstruction of existing roads may temporarily increase access to fish populations in the project area. This effect should be minimal. This increased access would end when logging is completed and the roads are again put into a storage condition. Fishing and shellfish harvesting occurs primarily from boats, on beaches, and along estuaries. Most use is by people who occasionally occupy the logging camp, hunters who occasionally fish during hunting trips, and commercial fishermen using either Saginaw Bay or Rowan Bay as anchorages.

3.3.21.3 Competition for Fish and Shellfish

The proposed activities for this project should not increase competition for fish and shellfish. Fishing and shellfish harvesting occurs primarily from boats, on beaches, and along estuaries. Some increased activity may occur in the streams of the Kuiu Timber Sale Area due to opening of roads during project implementation and temporary residence at the logging camp during logging activities. Saltwater fishing may also increase during temporary occupation of the logging camp. These activities would be of short duration and narrow in scope.

3.3.21.4 Subsistence Use Fish and Shellfish Effects and Evaluation

Subsistence fishing and shellfish harvesting in or near the Kuiu Timber Area are not likely to be adversely affected by the proposed activities for this project. As discussed above, the distribution and abundance of these resources should not change as a result of this project, and any change, in access or competition for these resources should be minor and of limited duration.

3.3.22 Upland Birds and Waterfowl Effects and Evaluation

3.3.22.1 Abundance and Distribution of Upland Birds and Waterfowl

Upland game birds, such as grouse, are found throughout the Kuiu Timber Sale Area.

Waterfowl nesting and breeding areas are adjacent to the project area. Saginaw, Security, and Rowan bays all provide resting, nesting, and feeding habitats for waterfowl throughout the year. Rocky Pass, to the east of the project area, provides excellent habitat for waterfowl.

Upland birds do not seem to be affected by increased road access. The amount of upland bird habitat unaffected by the proposed projects will support the current populations. Beach, estuary, and riparian buffers would retain habitat for waterfowl. The Forest Plan standard and guideline for waterfowl buffers would be applied if necessary to protect nesting or breeding waterfowl.

No measurable effects on bird populations are expected for any of the action alternatives.

3.3.22.2 Access to Upland Birds and Waterfowl

Road building associated with timber harvest would temporarily increase access to upland bird hunting areas. Access to waterfowl hunting areas along the shorelines would not change. All action alternatives would build roads providing foot access. Closed roads would be used for foot access until the regeneration of alder makes them impassable. It is expected that upland bird hunters would use the roads that remain open to motorized vehicle use.

3.3.22.3 Competition for Upland Birds and Waterfowl

Competition for upland birds and waterfowl should not be affected by any of the proposed activities. Bird hunting is usually done in the area surrounding the community. The number of hunters in the area may temporarily increase during active logging operations, but long-term competition would be reduced by road closures and the difficulty in accessing the area during the spring and fall months when these animals are normally harvested for food.

3.3.22.4 Subsistence Use Effects to Upland Birds and Waterfowl

Upland birds and waterfowl are a small percentage of the foods harvested by the people of Kake. The people of Petersburg use Mitkof Island and the Tonka road system on Kupreanof Island to harvest upland birds, and the Stikine River Flats, Duncan Canal, and Blind Slough to harvest waterfowl. They are taken more as an incidental species when they are encountered elsewhere. The activities proposed for this project should not change the distribution, abundance, or use of upland birds or waterfowl in the Kuiu Timber Sale Area.

3.3.23 Marine Mammals Effects and Evaluation

The Marine Mammal Protection Act of 1972 prohibits the taking of marine mammals by anyone other than Alaska Natives. The Act allows Alaska Natives to take marine mammals for subsistence or to create authentic native handicrafts or clothing as long as the activity is not wasteful in nature.

Forest Plan standards and guidelines for protection of marine mammal habitat would be followed and none of the alternatives is expected to negatively impact marine mammals. No significant restriction to the subsistence use of marine mammals is expected under any alternative.

3.3.24 Vegetation Effects and Evaluation

3.3.24.1 Personal Use Timber and Firewood

Each Alaska resident is entitled to 10,000 board feet of sawtimber and 25 cords of firewood every year for personal use, regardless of rural or non-rural residency status. Currently, two or three permits are issued yearly for subsistence wood use by all users within the Kuiu Timber Sale Area. This use occurs mostly in Saginaw and Security Bays. The area is not heavily used for firewood gathering. Other places on the Petersburg Ranger District are more popular because of their proximity to a community.

3.3.24.2 Personal Use Timber Effects and Evaluation

None of the action alternatives should have an impact on personal use of timber in the Kuiu Timber Sale Area.

3.3.24.3 Food Plants

Subsistence plant foods consist of a variety of species. Some of the most sought after types include kelp, seaweed, goose tongue, mushrooms, and berries. Roads and previous timber harvest areas within the project area are excellent berry harvest locations since many berry species thrive on open exposed slopes (Alaback 1982). However, since project area roads are not connected to any community, few people would be expected to use these new berry harvest locations. Most traditional gathering of other plants and foods occurs near beach and estuarine areas. Based on an expected increase of berries due to forage production in new harvest units, and the locations of proposed activities, none of the alternatives are expected to negatively affect subsistence plant gathering for food. Reasonably foreseeable effects of the action alternatives on the abundance and distribution of food plants would be minimal.

3.3.25 Cumulative Effects

The subsistence analysis evaluates whether the project, in combination with other past, present, and reasonably foreseeable future actions, may significantly restrict subsistence uses. Although the precise location of future projects is not clearly known, some conclusions can be reasonably made about future impacts.

The analysis for the Kuiu Timber Sale Area indicates that for any action alternative, the proposed timber harvest, in combination with past and reasonably foreseeable future timber harvest, will not likely result in significant restrictions on subsistence use of resources other than deer.

The Forest Plan addressed the long-term consequences on subsistence and concluded that full implementation of the Forest Plan may result in a significant restriction to subsistence use of deer due to the potential effects of projects on the abundance and distribution of deer, and on competition for deer (Forest Plan ROD, page 24).

Several measures are designed to maintain subsistence species over time, especially deer populations. Habitat is set aside in 1,000-foot beach and estuary buffers. These areas protect key habitats for deer winter use, black bear, furbearers, waterfowl, and intertidal food gathering. Application of Forest Plan Riparian Standards and Guidelines will minimize future impacts to fish habitat. Small old-growth habitat reserves have been located to include some of the most important deer winter habitat. Other possible measures include partial harvest prescriptions and thinning second growth to promote understory vegetation for browse. Partial harvest prescriptions are proposed in Alternatives 2, 3, and to a lesser extent 4, to provide for retention of wildlife habitat in areas showing evidence of high wildlife use. Thinning of the harvested stands would be scheduled as needed.

There are two sorts of potential enhancements associated with the Kuiu Timber Sale Area that could benefit subsistence uses in the area:

- Opportunities for precommercial thinning would potentially increase the opportunities for harvesting deer. Management activities proposed for this project would increase production of forage for deer by opening the forest overstory. This effect would last for approximately 25 to 30 years. At that time, second growth management activities would be needed to maintain this increase in understory forbs for deer.
- Access management (primarily road management) is a more complex issue and is covered in the Transportation section of this chapter.

Other projects and considerations are:

- ongoing Forest Service Timber Sales (Threemile (outside project area, and Rowan Mountain sale (within the project area)),
- future Forest Service timber sale project areas in adjacent areas (Bayport),
- other Forest Service programs such as the provision of personal use wood,
- timber offered by other landowners (private, state of Alaska, Mental Health Trust), and
- general population dynamics.

A general discussion of these factors is provided in this section, first in terms of subsistence and then in terms socioeconomics.

The effects from a single project are not likely to significantly alter deer habitat capability in WAA 5012. In 2095, the Forest Plan FEIS (p. 3-373) predicts that Kuiu Island will retain 56 percent of the 1954 deer habitat capability in WAA 5012 (compared to 80 percent in 1995). These projections were made using the assumption that the Forest Plan would be implemented in its entirety (most harvest completed using even-aged management, clearcutting). To date, planned timber harvest on Kuiu Island has had less impact on wildlife habitat values than predicted because modified prescriptions have reduced the use of clearcutting as the major method for cutting trees. Estimates on the deer availability and anticipated demand in areas used by rural residents indicate that sufficient numbers of deer should be available to provide for all federally qualified subsistence users (rural Alaskan residents). However, due to projected human population increases and some habitat degradation (reduced deer habitat capability) in the long term, demand for deer for all hunters (subsistence plus sport) may well exceed supply. To date this expected

population growth has not occurred but it could change in years to come. At that time, a restriction on sport hunting may be required (Forest Plan FEIS Part 2, p. 3-625). The current bag limit is two antlered deer in Game Management Unit 3. Very few deer are harvested on Kuiu Island annually. Thus, cumulative effects on the subsistence use pattern of Kuiu Island by rural residents will remain unaltered.

The Alaska Department of Fish and Game has set deer population objectives for all Wildlife Analysis Areas (WAAs) on the Tongass National Forest. The population objective set by the State of Alaska for WAA 5012 is 5,390 animals, based on hunter demand (ADFG 1991). The current deer habitat capability in WAA 5012 is approximately 6,641 deer, with 4,250 deer theoretically available to hunters after accounting for wolf predation. We used the following criteria and assumptions to analyze hunter demand:

- Hunter demand is from "Strategic Plan for Management of Deer in Southeast Alaska 1991-1995, Population Objectives" (ADFG 1991).
- The number of deer needed for a huntable surplus is ten times the hunter demand.
- The 1960s deer harvest level was assumed 100 percent subsistence.

The Alaska Department of Fish and Game estimated hunter demand for deer in WAA 5012 to be 68 deer, based on estimated annual harvest during the years 1960-1968. To sustain a healthy deer population, harvest should not exceed ten percent of the deer population in any WAA (Forest Plan FEIS Part 1, Page 3-361). Therefore, a minimum number of deer needed to meet the hunter demand of the 1960s would be 680 deer. This is well within the capability of the WAA and is therefore considered to be a sustainable harvest.

According to model predictions, WAA 5012 can meet the State of Alaska's population objectives for a deer population to meet current hunter demand for all alternatives.

The Federal Subsistence Board has the authority to regulate subsistence and non-subsistence use of resources in the Tongass National Forest when those resources are approaching scarcity. If necessary, this type of action, as prescribed by ANILCA Section 804, could be used to ensure the availability of adequate subsistence resources needed by the rural communities using the Kuiu Timber Sale Area.

3.3.26 ANILCA Compliance

The actions proposed in this document have been examined to determine whether they are in compliance with the Alaska National Interest Lands Conservation Act (ANILCA) Section 810. Standards used for the review include:

- National Forest Management Act of 1976 and its implementing regulations
- Alaska National Interest Lands Conservation Act (1980)
- Tongass Land and Resource Management Plan (1997)
- Tongass Timber Reform Act (1990)
- Alaska State Forest Practices Act (1993)
- Alaska Coastal Management Program (1997)
- Multiple Use Sustained Yield Act (1960)
- USDA Forest Service Subsistence Management and Use Handbook (FSH 2609.25)

The proposed actions have been determined to be in compliance with these standards, and with ANILCA.

3.3.26.1 Necessary, Consistent with Sound Management of Public Lands

ANILCA Title VIII places an emphasis on the maintenance of subsistence resources and lifestyles. However, the Act also provides for adequate opportunity for satisfaction of the economic and social needs of the state of Alaska and its people and recognizes that public lands are necessary and appropriate for more intensive uses. The Act also requires the Forest Service to make available 4.5 billion board feet per decade from the Tongass National Forest. The Tongass Timber Reform Act (TTRA) removed the 4.5 billion board foot requirement, but directs the Forest Service to seek to meet market demand for timber to the extent consistent with providing for the multiple use and sustained yield of all renewable forest resources, and subject to applicable law.

The Forest Plan has determined that the Kuiu Timber Sale is necessary as a component of the timber management program designed to implement the Forest Plan and to meet TTRA direction. There is currently a market demand for timber, a limited timber supply from other sources, and an under-utilized mill capacity in the region. The volume from the project is a component of the Tongass National Forest 5-year timber sale schedule, which seeks to provide timber to industry in an even-flow over the planning cycle. This project can help meet the Forest Plan and TTRA objectives, while also providing reasonable protection measures for forest resources, especially for

subsistence. It is consistent with the Forest Plan, laws, regulations, policies, public needs, and the capabilities of the land.

The alternatives presented here encompass four action alternatives that would help achieve multiple-use management objectives in the Forest Plan. For subsistence deer use, a significant possibility of a significant restriction on the current level of subsistence deer harvest on Kuiu Island is not likely under any of the alternatives. It is well within the capability of the WAA to meet hunter demand for subsistence deer use and is therefore considered to be a sustainable harvest.

3.3.26.2 Amount of Land Necessary to Accomplish the Purpose of the Proposed Action

The amount of public land necessary to implement the Kuiu Timber Sale (considering sound multiple use management of public lands) is the minimum necessary to accomplish the purpose of the project. One or more rural communities use much of the Tongass National Forest for subsistence purposes. It is not possible to reduce timber harvest in one area, and concentrate it in another without influencing one or more rural communities' important subsistence use areas. In addition, harvestable populations of subsistence wildlife species could not be maintained in a natural distribution across the forest if harvest were concentrated in specific areas. A well-distributed population of species is required by the National Forest Management Act and is one of the objectives of the Forest Plan.

The Forest Plan allocated many of the important subsistence use areas to land use designations that do not allow timber harvest. Other areas that are important to subsistence use were protected through standards and guidelines, such as the 1,000-foot beach and estuary buffers and the streamside Riparian Management Areas, which do not allow timber harvest.

The Kuiu Timber Sale Area is about 42,102 acres. The acreages for proposed harvest units range from 491 acres in Alternative 2 to 1,425 acres in Alternative 4. Given the framework and emphasis of each alternative, the minimum amount of land was used to resolve resource concerns while meeting the purpose and need for the project in a practical and efficient manner. Resources are protected to the maximum extent practicable and the project meets or exceeds Forest Plan standards and guidelines.

3.3.26.3 Reasonable Steps to Minimize Adverse Impacts on Subsistence Uses and Resources

The Forest Plan took considerable steps to minimize adverse impacts to subsistence uses and resources. Forest Plan standards and guidelines protect important deer winter habitat. Other reasonable steps taken to minimize adverse impacts to subsistence resources include: (1) the

overall Forest Plan land use designation strategy, (2) the old-growth habitat reserve strategy, (3) travel and access management planning, (4) Forest Plan standards and guidelines for stream, beach and estuary buffers, and (5) the use of silvicultural systems that maintain components of overstory tree canopy.

Chapter 2 and Appendix B of this EIS describe mitigation measures that would be implemented as part of each alternative. Most of the mitigation measures are designed to maintain fish and wildlife habitat productivity, while still harvesting timber to meet the purpose and need of this project. Additionally, all action alternatives would reduce the number of miles of open roads in the project area. No new classified roads designed for long-term use are proposed and temporary roads proposed for construction would be decommissioned following logging.

One of the most significant protection measures is the use of timber harvest methods other than even-aged management clearcutting. In many units, the harvested timber would be dispersed throughout the unit, leaving 50 percent of the pre-harvest basal area after harvest. Such harvest would maintain overstory canopy that would reduce impacts to deer winter habitat and old growth habitat. Small old-growth habitat reserves have been designed to improve protection of high-value deer winter habitat and connectivity between reserves.

The project reflects a reasonable balance between the projected need for timber from the project area to help meet the Forest Plan, ANILCA, and TTRA timber-related objectives, and the continued protection of subsistence uses and resources. Impacts on subsistence resources have been minimized through the design and location of the individual harvest units, and through the formulation of the alternatives. Reasonable measures to minimize impacts on subsistence have been adopted to the maximum extent practicable while still meeting the purpose and need for this project.

3.3.27 Conclusions and Findings

The potential foreseeable effects from the action alternatives in the Kuiu Timber Sale Area are not expected to result in a significant restriction of subsistence uses of Sitka black-tailed deer, black bear, moose, furbearers, marine mammals, upland birds, waterfowl, salmon, other finfish, shellfish, or other foods.

Based on the habitat modeling and subsistence deer harvest reported by the Alaska Department of Fish and Game, the Federal Subsistence Program, and the Forest Plan, the current level of subsistence harvest (1992-2005) can be achieved for any of the alternatives within the project area.

The Forest Plan concluded that the potential cumulative effects of implementation of the Plan could lead to a significant restriction to

subsistence use of deer some time in the future due to the potential effects of projects on the abundance and distribution of these resources, and on competition for these resources (Forest Plan Record of Decision, p. 36). However, the analysis was based on an assumed 18 percent increase in community population growth for each of the first two decades and a 15 percent increase for each of the next three decades (Forest Plan FEIS Part 2, p. 3-528). Populations in Southeast Alaska have actually declined an average of three percent between 1995 and 2003, with Petersburg showing a nine percent decline and Kake showing a 2 percent decline (Matson 2004). Given the recent population declines, it is likely that this restriction, if it occurs, would occur somewhat later than predicted.

The possibility of this restriction is necessary, consistent with sound management principles for the utilization of public lands, and will involve the minimal amount of public lands necessary to accomplish the purposes of this use. Reasonable steps have been taken to minimize the adverse impacts upon subsistence users and resources.

A subsistence hearing will be held in Petersburg and Kake, Alaska during the 45-day public comment period for the EIS. The results of this hearing will be reported in the Final Environmental Impact Statement for this project.

3.4 Issue 3 – Timber Sale Economics

Introduction

This issue concerns the ability of Southeast Alaska's timber purchasers to make a profit and stay in business, and the implications for the economic health of the communities in the region. Specifically, can the forest products industry in Southeast Alaska remain viable if timber harvest alternatives are not economically viable across fluctuating market conditions? There is also concern about the decreasing amount of timber available for sale from national forests and how an unstable supply affects local employment and revenues. Timber purchasers and affected communities are concerned about the quantity, quality, frequency, and profitability of timber offered for sale from the Tongass National Forest.

Some comments that were received during the scoping period offered suggestions for improving overall timber harvest economics on the Tongass National Forest. Suggestions included: 1) meet the Forest Plan Allowable Sale Quantity to ensure adequate supply; 2) provide economic sales that allow adequate profit for both small and medium-sized businesses; 3) limit the use of helicopter yarding; 4) minimize the use of partial harvest; and 5) minimize road construction.

The discussion of economics for the Kuiu Timber Sale Area is based on financial efficiency economics, which uses the Forest Service timber appraisal system to compare the relative value of the alternatives. Since the possibility exists for all action alternatives to offer timber in more than one sale over a period of several years, during which timber values are likely to fluctuate, this comparison can only be used for relative values rather than for exact monetary values.

The financial efficiency analysis of the alternatives on which the Kuiu Timber Sale Economic Analysis is based considers the following factors:

- volume offered,
- logging costs,
- stumpage values (predicted bid per unit of measure),
- present net value (direct income), and
- timber industry jobs (direct jobs).

Timber markets and values tend to fluctuate dramatically. In the past, timber sales on the Petersburg Ranger District have had multiple bidders and have been bid up above advertised rates. Some of these sales are no longer economical to operate under current market conditions. Economic factors including future market conditions

(which are unknown) would be given careful consideration in the design and scheduling of individual sale offerings from the selected alternative.

3.4.2 Financial Efficiency Economics

Financial efficiency is a comparison of those costs and benefits that can be quantified in terms of actual dollars spent or received within the project area. When considering quantitative issues, financial efficiency analysis offers a consistent measure in dollars for comparison of alternatives. A discussion of non-market benefits, values, and costs can be found in the Socioeconomics section of this chapter. Although individual timber harvest units may or may not be economical to harvest by themselves, the management of less productive land, or land containing a high percentage of defective timber, helps to increase future timber yields. The harvest of units with higher returns helps compensate for those units that are less economical.

3.4.2.1 Volume Estimates

Volume calculations for this economic analysis are based on information from stand exams. Volumes for the alternatives are displayed in hundred cubic feet (ccf) and in thousand board feet (mbf) in Table 3-31. The conversion ratio between board feet and cubic feet depends on the amount of taper in a log. Taper is the difference between the smallest and largest diameter of the log. On the Tongass National Forest, the board foot to cubic foot ratio varies between about four and six board feet per cubic foot.

Table 3 - 31. Estimated volumes proposed for harvest by alternative

	Alternative				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Total Volume (mbf)	0	14,572	23,586	42,649	36,291
Total Volume (ccf)	0	29,738	48,134	87,039	74,063

The sum of unit volumes by species is also factored into the economic analysis. Table 3-62 in the Timber and Vegetation section of this chapter displays the species composition in proposed harvest units for each action alternative.

3.4.2.2 Road Construction Costs/Logging Costs

The Transaction Evidence Appraisal (TEA) process calculates net stumpage values from previous timber sales that were sold during an identified base period. The predicted stumpage value for any given sale is based on the average of these previously sold sales, with

adjustments for sale specific data. Logging costs (stump-to-truck costs) vary by quality and quantity of timber per acre. Logging costs include timber falling, bucking, yarding, sorting, and loading. Haul costs have been calculated for both Rowan and Saginaw Bays (Table 3-32 and Table 3-34). Towing/barging cost is figured to the nearest production site for all materials, sawlogs, and utility wood. All alternatives were appraised assuming towing/barging to the same production site, Sawmill Cove Wrangell, Alaska. Road costs include the construction of temporary roads and the reconstruction and maintenance of classified roads. The difference in net stumpage values between the action alternatives (Table 3-32 and Table 3-34 can be attributed to multiple factors including:

- differences in volume harvested and species composition (see the Timber and Vegetation section of this chapter), timber quality, and harvest prescriptions (Table 3-36),
- differences in the logging systems, such as helicopter yarding (Table 3-37), and
- the type and amount of road construction (see the Transportation Section of this chapter).

3.4.2.3 NEPA Economic Analysis Tool

NEPA Economic Analysis Tool (NEAT) was used to analyze the alternatives based on the Transaction Evidence Appraisal (TEA) method. The analysis compares estimated costs (Table 3-32 and Table 3-34 and predicts a bid value for each action alternative (Table 3-33 and Table 3-35). NEAT calculates the predicted bid value of the proposed timber harvest alternatives by making adjustments to the regional base period price. Base period price is the weighted average of bid values, logging costs, and timber quality from a minimum of ten of the most recent sales sold on the Tongass National Forest. The predicted bid value for each of the Kuiu Timber Sale Area alternatives is calculated by adjusting the regional base period price to account for the specific logging characteristics and timber quality of the alternative.

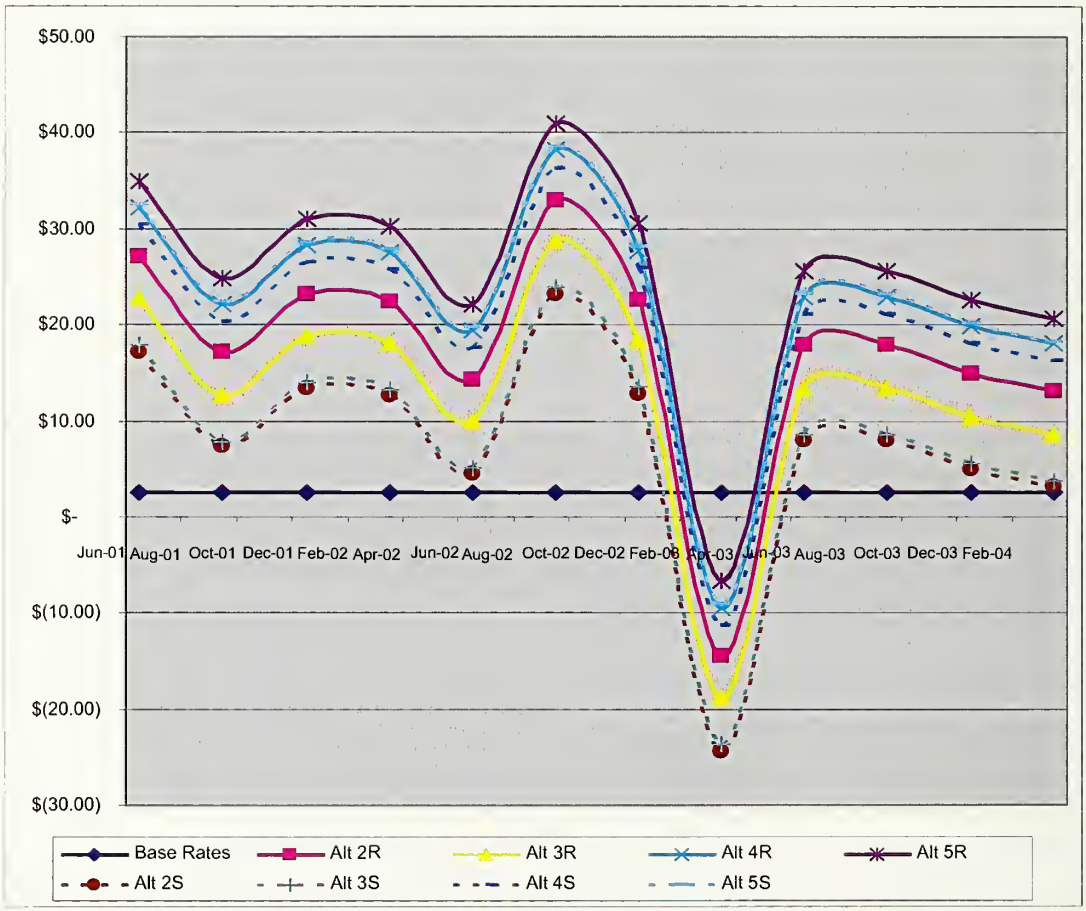
The difference in expected bid among the action alternatives can be attributed to multiple factors, including:

- differences in species composition, volume per acre harvested, and timber quality,
- differences in harvest prescriptions,
- percentages of cable, shovel, and helicopter yarding systems,
- amount of temporary road construction,

- differences in haul distances, and
- unique costs associated with the alternative.

The "Alternative Expected Bid" for each of the 12 Appraisal Quarters between June 2001 and March 2004 is displayed in Chart 3-1. The value for the March 2004 quarter is used to compare alternatives in this analysis. Display of expected bids for 12 appraisal quarters is used to illustrate market fluctuations and trends. By looking at predicted bid values of the alternatives over a period of time, the economics of a given alternative can be estimated for a range of market conditions.

Chart 3-1. NEAT expected bid rate by appraisal quarter



Alt 2R – Alt 4R = Haul to Rowan Bay LTF
Alt 2S – Alt 4S = Haul to Saginaw Bay LTF

Table 3 - 32. NEAT logging costs by alternative for haul to Rowan Bay LTF

Cost Item		Alternatives				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Stump-to-truck	$ per ccf	N/A	$67.61	$66.93	$60.18	$52.96
	$ per mbf	N/A	$137.98	$136.59	$122.82	$108.08
Haul, barge, tow	$ per ccf	N/A	$26.12	$26.12	$26.12	$26.12
	$ per mbf	N/A	$53.31	$53.31	$53.31	$53.31
Road Maintenance	$ per ccf	N/A	$3.90	$4.09	$3.59	$3.78
	$ per mbf	N/A	$7.95	$8.35	$7.33	$7.71
Unusual Adjustments[a]	$ per ccf	N/A	$3.87	$3.71	$4.07	$4.84
	$ per mbf	N/A	$7.91	$7.57	$8.31	$9.88
Road Costs	$ per ccf	N/A	$10.70	$15.29	$13.58	$15.95
	$ per mbf	N/A	$21.85	$31.20	$27.71	$32.55
Total	$ per ccf	N/A	$112.21	$116.14	$107.54	$103.65
	$ per mbf	N/A	$229.00	$237.02	$219.47	$211.53

[a] Unusual adjustments are estimates for surface replacement deposits, camp days, and camp setup costs.

Table 3 - 33. Appraised Value to Rowan Bay LTF

Alternative		1	2	3	4	5
High Market	**$/mbf**	N/A	$33.03	$28.78	$38.19	$40.95
Low Market	**$/mbf**	N/A	($14.52)	($18.83)	($9.44)	($6.66)
Expected Bid ($/mbf)		**N/A**	**$13.03**	**$8.51**	**$18.04**	**$20.59**

Table 3 - 34. NEAT logging costs by alternative for haul to Saginaw Bay LTF

Cost Item		Alternatives				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Stump-to-truck	**$ per ccf**	N/A	$67.61	$66.93	$60.18	$52.96
	$ per mbf	N/A	$137.98	$136.59	$122.92	$108.08
Haul, barge, tow	**$ per ccf**	N/A	$24.51	$24.51	$24.51	$24.51
	$ per mbf	N/A	$50.02	$50.02	$50.02	$50.02
Road Maintenance	**$ per ccf**	N/A	$2.32	$2.40	$2.53	$2.50
	$ per mbf	N/A	$4.73	$4.90	$5.16	$5.10
Unusual Adjustments[a]	**$ per ccf**	N/A	$12.29	$8.96	$6.99	$8.27
	$ per mbf	N/A	$25.08	$18.29	$14.27	$16.88
Road Costs	**$ per ccf**	N/A	$15.33	$18.15	$15.16	$17.81
	$ per mbf	N/A	$31.29	$37.04	$30.93	$36.35
Total	**$ per ccf**	N/A	$122.06	$120.95	$109.37	$106.05
	$ per mbf	N/A	$249.10	$246.84	$223.20	$216.43

[a] Unusual adjustments are estimates for surface replacement deposits, camp days, and camp setup costs and include costs associated with reconstruction of Saginaw Bay LTF and sort yard.

Table 3 - 35. Appraised Value to Saginaw Bay LTF

Alternative		1	2	3	4	5
High Market	**$/mbf**	N/A	$23.18	$23.97	$36.36	$38.55
Low Market	**$/mbf**	N/A	($24.37)	($23.64)	($11.28)	($9.07)
Expected Bid (mbf)		**N/A**	**$3.18**	**$3.71**	**$16.21**	**$18.19**

3.4.2.4 ASQ and Non-Interchangeable Components (NIC)

The allowable sale quantity (ASQ) is the amount of timber that can be sold from lands suitable for timber production by decade for a National Forest. It is divided into two non-interchangeable components (NIC I and NIC II) based on economic factors. Timber harvest is easier and more economical on NIC I lands than it is on NIC II lands. Refer to Appendix A for more information about the ASQ. For the Kuiu Timber Sale Area, all of the proposed timber harvest units are on NIC I lands (see the Transportation section in this chapter).

3.4.2.5 Harvest Prescriptions

In general, the more volume per acre removed from a stand, the lower the per-unit logging cost. Table 3-36 displays the harvest prescription acres by alternative.

Table 3 - 36. Acres of harvest prescriptions by alternative

Harvest System	Alternative				
	Alt 1	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**
Even-aged management (clearcut)	0	197	409	1,026	1,231
Two-aged management (clearcut with reserves)	0	188	294	142	0
Uneven-aged management (single tree selection)	0	87	72	215	0
Uneven-aged management (group selection)	0	19	19	42	0
Total	**0**	**491**	**794**	**1,425**	**1,231**

Logging Systems

Three different logging systems are proposed in the Kuiu Timber Sale Area. Total acres by yarding system are shown in Table 3-37. Proposed yarding methods for individual units are noted on the unit cards (Appendix B).

Table 3 - 37. Acres of proposed timber harvest by logging system

Harvest System	Alternative				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Cable	0	408	759	1,108	1,082
Shovel	0	83	35	147	149
Helicopter	0	0	0	170	0
Total	0	491	794	1,425	1,231

Cable yarding

Cable yarding systems are best suited for steep slopes and wet soils. Cable systems minimize soil disturbance by partially or fully suspending the logs over the ground. Harvest prescriptions are more limited with cable systems compared to the other systems because a clear path is needed to convey the logs to the landing.

Cable yarding is most efficient with clearcut systems. Partial harvest is possible, but the tower for the cable system needs to be moved more often, which increases costs. Downhill yarding needs to be in corridors, since there is less control of the logs as they approach the landings. Uphill yarding gives more flexibility, especially if a lateral carriage is used to bring the logs from the sides to the middle of the corridor. Extra care is needed to protect the remaining trees in a partial harvest. The average cost of cable yarding used in this analysis is $96.22/mbf.

Among the action alternatives, Alternative 4 proposes the most cable logging, followed in descending order by Alternative 5, Alternative 3, and Alternative 2.

Shovel yarding

Track mounted log loaders (shovels) have been used throughout the Tongass National Forest where the slope is generally less than 20 percent. Placing slash underneath the tracks as the loader moves through the unit provides a mat to displace the weight of the equipment over a larger surface area, which minimizes the possibility

of soil compaction. Shovel yarding is limited to roadsides. The average yarding distance on each side of the road has been 300 feet. Recently, however, distances of up to 900 feet have been shovel yarded. In many units, shovel yarding is used for the timber near the road and the rest of the unit is cable logged. Shovel logging does provide flexibility in the selection of trees to be harvested. Shovel yarding is the least costly yarding method used in this analysis. The average cost of shovel yarding used in this analysis is $85.83/mbf.

Among the action alternatives, Alternative 5 proposes the most shovel logging, followed in descending order by Alternative 4, Alternative 2, and Alternative 3.

Helicopter yarding

Helicopter yarding is one of the more costly logging systems due to the high operating and helicopter maintenance costs. The average cost of helicopter yarding used in this analysis is $337/mbf. However, helicopter yarding does provide land managers with options not available with other land-based yarding systems and can result in less ground disturbance than traditional ground-based systems. Advantages of helicopter logging are:

- minimized unit ground disturbance,
- ability to implement more complex silvicultural prescriptions, and
- reduced need for classified and/or temporary road building.

Unit ground disturbance is minimized since logs are lifted to the landing rather than dragged along the ground as with cable systems. Other advantages include the ability to implement more complex silvicultural prescriptions such as patch cuts and individual tree selection, which may not be feasible with cable and shovel systems.

Helicopter yarding is most sensitive to the variables that influence the economic viability of logging systems. Alternative design plays an important role in the overall economics of those alternatives containing helicopter yarding. Three factors that directly impact yarding costs are turn-time, payload, and the type of helicopter used. Helicopter units located closest to existing roads and harvest prescriptions that allow for maximum payloads provide better economics.

Alternative 4 is the only alternative that proposes helicopter yarding.

3.4.2.6 Small Sales

Maintaining a consistent small sales offering is a component of the Petersburg Ranger District timber sale program. Due to the distance of the Kuiu Timber Sale Area from processors, it is unlikely individual units would be offered for sale.

Small Business Administration Program

The Forest Service and the Small Business Administration review market demand and supply and agree on an annual amount of volume to be offered to small businesses from the Tongass National Forest. Once an alternative has been selected in the Record of Decision, the number and size of the individual sales to be offered (if any) will be determined as part of the update to the Tongass National Forest five-year sale schedule. Currently, the proposed volume from the Kuiu Timber Sale Area would be offered in a single sale and as an opportunity for small businesses. All of the mills in Southeast Alaska currently qualify as small businesses.

3.4.2.7 Employment

Any of the proposed action alternatives could generate or maintain employment and income in Southeast Alaska as a result of timber harvest, if timber is offered and sold (Table 3-38). Employment would be both directly and indirectly related to timber harvest activities. Indirect employment refers to businesses supporting the wood products industry. Direct jobs are logging, construction, marine transport, and processing. Historically, Alaska yellow cedar has been exported and it is likely this pattern will not change in the near future. NEAT analysis predicts direct employment and is adjusted to account for expected Alaska yellow cedar export.

Predictably, the higher the volume of timber available and sold, the more jobs and income that would result. The Forest Plan FEIS, which bases its employment figures on the Tongass-wide timber base, has indicated the estimated number of available jobs expected for the planning period.

Table 3 - 38. Direct employment calculation adjusted for Alaska yellow cedar export

		Alt 2	Alt 3	Alt 4	Alt 5
A.	Direct employment from NEAT	79	127	230	196
B.	Alt volume (CCF)	29,738	48,134	87,039	74,063
C.	Logging employment	29	47	85	72
D.	AYC volume (CCF)	416	733	1,216	1,176
E.	AYC job reduction for export	1	1	2	2
F.	Total adjusted direct employment	**78**	**126**	**228**	**194**
G.	Direct income (million $)	**3.50**	**5.66**	**10.23**	**8.71**

A=Direct Jobs using the estimated volume for each alternative and the direct job coefficient used in the NEAT Analysis.
B=The total alternative volume.
C=Direct Jobs for the logging and related component of Total Direct Employment.
D=Estimated Alaska Yellow Cedar export volume.
E=Estimated sawmill jobs not realized due to Alaska Yellow Cedar export.
F=Direct Employment from NEAT – AYC Job Reduction for Export.

3.4.2.8 Payments to the State of Alaska

The "Secure Rural Schools and Community Self-Determination Act of 2000" replaced the Twenty-five Percent Act of 1908, as amended. These Acts provide for part of the timber sale receipts for National Forest timber to be returned to the states to be used for public schools and roads. The states then distribute the receipts to organized boroughs and municipalities based on miles of road and school enrollment. Communities within the Unorganized Borough, which includes Petersburg, will receive payments based on the state's three highest payments between the years 1986 and 1999. This payment is currently authorized through fiscal year 2006.

3.4.3 Administrative Project Costs

3.4.3.1 Public Investment Analysis

Public investment analysis of each alternative compares the value of the timber with the cost of preparing the timber sale. The average Region 10 budget allocation costs and management expenses are subtracted from net stumpage revenues to determine net value. The costs and management expenses include environmental analysis, sale preparation, sale administration, and engineering support. Forest Service cost per thousand board feet (mbf) is based on the Region 10

average budget allocation of $41/mbf for analysis, $23/mbf for sale preparation, $9/mbf for sale administration, and $28/mbf for engineering support.

3.4.3.2 Environmental Analysis

Environmental analysis costs include field inventory and the analysis of data, public involvement, and the preparation of a document that satisfies the requirements of the National Environmental Policy Act. The timeframe is about two years and involves many resource specialists. Although it is based on timber volume, the cost fluctuates more with the amount of area to be examined and the accessibility of that area. The Kuiu Timber Sale Area is accessible by helicopter, floatplane or boat, and is located on Kuiu Island on the Petersburg Ranger District. The environmental analysis cost is constant and applies to all alternatives, including the No-Action alternative.

3.4.3.3 Sale Administration

Sale administration costs are higher when helicopter logging is involved because of the increased cost of accessing the timber harvest for administration. Scattered and smaller harvest areas are more costly to visit. Because of the higher sale administration costs for helicopter yarding, Alternative 4 would have higher costs than the other action alternatives. Alternative 5 would be the next most costly.

3.4.3.4 Sale Preparation

Unit layout and cruising costs increase significantly when partial harvest is prescribed compared to clearcutting. The Alternatives-to-clearcutting Research Study on Kupreanof Island required about eight times more person-days to prepare a unit that involved marking individual trees throughout the unit compared to a clearcut unit. Designation of two-acre patches took about four times longer than a clearcut. Accessibility to the units is another major cost factor. Helicopter access and steeper terrain increase sale preparation costs compared to areas with existing road access.

3.4.4 Economic Analysis

Economic efficiency analysis or cost/benefit analysis is best done at a scale much larger than a project area. A regional scale economic analysis is presented in the Forest Plan FEIS Part 2, which balances resource uses and values for the Tongass National Forest. The economic analysis compares the costs and benefits of all resources, whether or not these costs and benefits are realized as an explicit market price. This analysis considers a variety of positive and negative resource-related external factors, passive use, non-consumptive use, and opportunity costs at various scales.

An economic efficiency analysis includes benefits and costs that are not easily valued through the market or exchange of money and can be difficult to quantify or summarize. Often, the same impact may be

considered a cost to some and a benefit to others depending on individual values. The analysis in this document tiers to the analysis done in the Forest Plan for non-commodity resources. Direct effects of the Kuiu project for economic sectors are displayed in the previous tables to the extent that they are known.

Alternative 1, No-Action, would maintain the current level of opportunities other than timber harvest for resource use. Those people interested in maintaining unroaded areas, primitive recreation opportunities, current levels of roaded access, and scenery would have the same condition in the near future as they have now. Those interested in using or expanding roaded recreation and access, or increasing wood product resource uses, would also have the same opportunities in the near future as they do now.

All action alternatives would cause changes to the existing economic conditions. These changes are described as increases or decreases in opportunities, benefits, or costs. In general, alternatives with lower harvest levels tend to have less impact on other resources when compared to those with higher levels. Many of the "costs" are short-term, lasting only as long as the timber sale is active. Wood products employment associated with the sales, noise, LTF activity, and increased traffic are examples of short-term impacts. Other costs have more long-term effects. Road development, visual changes to harvest units, increased access, and scenery changes are impacts that would remain after timber harvest.

3.4.5 Effects by Alternative

3.4.5.1 Effects common to all action alternatives

The timber from all alternatives was appraised assuming it would be barged to Wrangell from either Rowan Bay or Saginaw Bay LTF. NEAT analysis showed positive values for all alternatives in 11 of the 12 quarters used in the analysis.

3.4.5.2 Alternative 1

No timber would be harvested. In order to meet the estimated demand for timber, more timber may need to be harvested elsewhere on the Tongass National Forest. This alternative would provide no opportunities for local wood products employment, and no return to the U.S. Treasury. There would be no small sales offered for local operators. There would be no effect on commercial recreation use, commercial fisheries, or the current level of opportunities, other than timber harvest, for resource use.

3.4.5.3 Alternative 2

This alternative proposes to harvest 14,572 mbf using shovel and cable yarding systems. This alternative represents the lowest volume of the four action alternatives.

Estimated logging costs to Rowan Bay LTF would be $229.00/mbf and $249.10/mbf to Saginaw Bay. The predicted bid is $13.03/mbf for Rowan Bay LTF and $3.18/mbf for Saginaw Bay LTF. About 78 direct jobs and $3.5 million in direct income would be created.

3.4.5.4 Alternative 3

This alternative proposes to harvest 23,586 mbf using shovel and cable yarding systems. This alternative represents the lowest predicted bid value when hauled to Rowan Bay and is therefore the least economic alternative of the four action alternatives.

Estimated logging costs to Rowan Bay LTF would be $237.02/mbf and $246.84/mbf to Saginaw Bay. The estimated bid is similar to Alternative 2 when haul is to Saginaw Bay LTF. The predicted bid is $8.51/mbf for Rowan Bay LTF and $3.71/mbf to Saginaw Bay LTF. About 126 direct jobs and $5.66 million in direct income would be created.

3.4.5.5 Alternative 4

This alternative proposes to harvest 42,649 mbf using shovel, cable, and helicopter yarding systems. This alternative is the only alternative requiring the use of helicopter yarding systems, and has the highest volume of the alternatives.

Estimated logging costs to Rowan Bay LTF would be $219.47/mbf and $223.20/mbf to Saginaw Bay. The predicted bid is $18.04/mbf for Rowan Bay LTF and $16.21/mbf for Saginaw Bay LTF. About 228 direct jobs and $10.23 million in direct income would be created.

3.4.5.6 Alternative 5

This alternative proposes to harvest 36,291 mbf using shovel, and cable yarding systems. This alternative represents the only alternative that proposes clearcut prescription for all units and is therefore the most economical alternative.

Estimated logging costs to Rowan Bay LTF would be $211.53/mbf and $216.43/mbf to Saginaw Bay. The predicted bid is $20.59/mbf for Rowan Bay LTF and $18.19/mbf for Saginaw Bay LTF. About 194 direct jobs and $8.71 million in direct income would be created.

3.4.6 Cumulative Effects

3.4.6.1 Alternative 1

No timber would be harvested from the project area. Timber needed to meet estimated demand would have to be harvested from other areas on the Tongass National Forest.

3.4.6.2 Alternatives 2, 3, 4, and 5

These alternatives would help contribute to a stable timber industry in Southeast Alaska, which depends on a steady flow of economic timber sales in order for operators to make investments in machinery and

employ qualified workers. All the action alternatives would contribute to supplying economically viable timber sales to meet market demand. Volume from the Kuiu Timber Sale Area, in combination with other timber sales offered on the Tongass National Forest, would contribute to a stable long-term timber supply.

Other timber sale projects near the project area include volume approved in the Crane and Rowan Mountain Timber Sale FEIS (July 1998) of approximately 16.5 million board feet from 816 acres in 20 units, with approximately five miles of road construction, and harvest of units originally from the Alaska Pulp Corporation Long-Term Timber Sale Contract (North and East Kuiu FEIS, January 1993).

3.5 Issue 4 – Cumulative Effects of Logging and Road Construction on Watersheds

3.5.1 Introduction

This document describes the watersheds affected by the proposed Kuiu Timber Sale, and provides an analysis of the effects of the proposed activities on watershed resources. A detailed description of the watersheds affected by this project can be found in Appendix C.

Kuiu Island is subject to the State of Alaska Water Quality Standards (18 AAC 70), which are set according to protected water use classes and subclasses. Protected water use classes for freshwater include 1) water supply, 2) water recreation, and 3) growth and propagation of fish, shellfish, other aquatic life, and wildlife. The fresh waters of Kuiu Island are used primarily for water recreation and growth and propagation of fish, shellfish, other aquatic life, and wildlife. There is also some use of water for water supply at the Forest Service camp at Rowan Bay.

The Tongass Land and Resource Management Plan (Forest Plan) guides the management of soil and water resources on the Tongass National Forest. Appendix J of the Forest Plan describes the need for watershed analysis, defines the core topics of the watershed analysis, and guides the scale and intensity of the analysis. The scale, intensity, and complexity of the watershed analysis is to be commensurate with the level of cumulative risk. More intensive, complex, and field-based watershed analysis is conducted in watersheds with:

- high value fish habitat,
- high sediment yield risks or erosion potential,
- extensive very high and high hazard soils,
- presence of threatened, endangered, or sensitive species,
- more than 20 percent of the watershed acres with trees in second growth younger than 30 years, or
- a high density of roads and stream crossings.

The Kuiu Timber Sale proposes timber harvest and road building in some of the most extensively managed watersheds on the Petersburg Ranger District. All of the major watersheds within the project area have streams with high value fish habitat. Three of the watersheds within the project area have near 20 percent or greater cumulative harvest levels over the last 30 years, and there is a high potential for changes in stream channel condition if sediment loads increase. Public comment generated from scoping for the Kuiu Timber Sale indicated

that some people were concerned about the possibility of negative cumulative watershed effects resulting from the proposed project. To address the issue of cumulative watershed effects, and to follow the intent of the Forest Plan, a detailed watershed analysis was completed for the watersheds affected by proposed activities (Appendix C).

In this document, a basic watershed analysis is presented for all watersheds that could be affected by proposed activities. The basic watershed analysis includes a Sediment Risk Assessment, the details of which are described below. For watersheds that have had greater than 20 percent cumulative harvest within the last 30 years, a more detailed watershed analyses is presented. For these watersheds, the analysis incorporates the results of detailed, field-based assessments of stream channel condition. The criteria for these assessments are described below.

3.5.1.1 Sediment Risk Assessment

The Sediment Risk Assessment presented in this document originally appeared in the *Kuiu Island Landscape Assessment* (USDA FS 2005). This tool integrates stream, soil and watershed characteristics to facilitate a comparison of the relative potential for sediment-related changes in stream channels to occur among a group of watersheds. Because the assessment tool is designed to compare the relative sediment risk among groups of watersheds, it is most appropriately used at large scales where there are many watersheds with varying morphology.

The basic assumptions of the Sediment Risk Assessment are:

- The potential for sediment delivery to streams (transport potential) in a watershed increases with increases in the density of steep slopes, unstable soils, harvest areas, and roads.
- The higher the density of low-gradient, sediment-storing stream channels in a watershed (storage potential), the greater the chance that sediment inputs to streams will cause changes such as channel widening or pool filling.

This analysis results in the sediment risk index (SRI), which ranges from very low to very high (Table 3-39). The SRI is highest where there are combinations of high transport potential in headwaters areas of watersheds and high storage potential in the lower portions of watersheds.

The Sediment Risk Assessment (SRA) was run twice for the Kuiu Island Landscape Assessment, and a third time for this proposed timber sale. The first run did not account for timber harvest and road building. This provides an assessment of the inherent risk of sediment effects to streams based solely on the natural characteristics of the

watershed and the stream network. The second run of the SRA accounted for all roads and landings, regardless of their age, and all timber harvest occurring within the past 20 years. Except for roads and landings, timber harvest occurring more than 20 years ago was not accounted for because harvested slopes are expected to recover rooting strength in the soil and stabilize after a 20 year period (Brardinoni et al. 2002). The second run of the SRA was used to describe the current condition of the watersheds analyzed. The third run accounts for proposed harvest and road building associated with each alternative. Results of the third run are presented below under each alternative.

The Sediment Risk Analysis highlights the variations in watersheds on Kuiu Island with regard to watershed morphology, stream channel morphology, topography, and soil characteristics. These variations demonstrate why landslides and sediment related changes to stream channels—such as pool filling or channel widening—are more likely in some watersheds than others on Kuiu Island (Table 3-40). This is consistent with findings from research on landslide frequency (Swanston and Marion 1991), and stream channel response to sediment inputs (Montgomery and Buffington 1998).

The current SRI is either high or very high in five out of seven of the major watersheds in the project area (Table 3-40). Increases in the SRI above inherent levels reflect that timber harvest has temporarily increased the risk of landslides on harvested slopes, thereby potentially increasing sediment delivery to streams. This statement is consistent with research on forestry and landslide frequency in Southeast Alaska (Swanston and Marion 1991). For sediment-related changes to stream channels to occur, there must be an increase in sediment delivery to streams. Thus, minimizing the risk of sediment inputs to streams from landslides and roads provides a strategy for avoiding undesirable channel changes.

Table 3 - 39. Interpretation of the Sediment Risk Index (SRI)

SRI Percentile	SRI Ranking
Greater than 90th	Very High
Between 75th and 90th	High
Between 50th and 75th	Moderate
Between 25th and 50th	Low
Less than 25th	Very low

Table 3 - 40. Results from the Watershed Analysis for the Kuiu Island Landscape Assessment indicating the risk of sediment-related changes to stream channels when compared amongst 163 watersheds on Kuiu Island

Watershed	Inherent sediment risk index (SRI)	SRI after accounting for recent timber harvest
Saginaw Creek	Moderate	High
Security Creek	Moderate	High
WS #109-45-10090	Very low	Moderate
Dean Creek	Low	Moderate
Kadake Creek	High	Very high
Rowan Creek	Very high	Very high
WS #109-44-10370	Very high	Very high

3.5.1.2 Tongass Fish Habitat Objectives

The Forest Plan calls for using baseline fish habitat objectives, as described in the *Anadromous Fish Habitat Assessment* (USDA FS 1995), for evaluating the condition of aquatic habitat in stream channels. The Tongass maintains an inventory of stream channel measurements obtained in streams draining unharvested basins. This inventory allows percentile ranges to be defined for a set of physical habitat characteristics that are considered important to fish populations. This provides criteria for evaluating the physical habitat characteristics of streams draining harvested basins (Table 3-41). The criteria used for assessing the condition of physical habitat characteristics in this analysis include:

- pools per kilometer,
- percent of stream channel area in pools,
- pieces of large wood per kilometer of stream channel, and
- stream width-to-depth ratio.

Table 3 - 41. Interpretation of percentile ranking for stream channel characteristics

Parameter	Percentile ranking and interpretation			
	25th	50th	75th	
Pools per reach, percent pool area, LWD per 1000m^2	Poor	Fair	Good	Excellent
Width to depth ratio	Excellent	Good	Fair	Poor

3.5.2 Existing Condition

This analysis considers seven major watersheds on Kuiu Island (Table 3-42). Watersheds that do not have names on USGS quad maps are numbered according to the system used by ADF&G in the *Catalog of Waters Important for Anadromous Fishes* (Johnson et al. 2004). The watershed boundaries correspond to the 6th level Hydrologic Unit Code (HUC), and all are true watersheds; meaning that each watershed is well defined by topographic boundaries and all surface water within the watershed drains to a single stream or river.

Table 3 – 42. Watersheds within the Kuiu Timber Sale Area, cumulative harvest since 1975, and miles of roads

Watershed	ADF&G Number	WS Acres	Harvest (ac) since 1975	Existing road (mi)	Existing Road[a] (ac)	Cumulative harvest since 1975 (%)
Security Creek	109-45-10100	5,931	1,349	16.1	68.3	24
Saginaw Creek	109-44-10390	8,302	591	20.4	86.5	8
Unnamed	109-45-10090	2,140	374	11.6	49.2	20
Dean Creek	109-50-10070	4,690	1,399	16.3	69.2	31
Kadake Creek	109-42-10300	32,270	5,380	78.4	332.6	18
Rowan Creek	109-52-10060	13,234	1,304	23.5	99.6	11
Unnamed	109-44-10370	4,992	382	7.0	29.5	8

[a] Assumes that existing roads have an average clearing width of 35 feet. Actual clearing widths vary from zero on closed roads that have trees growing on them to 70 feet on classified roads.

3.5.2.2 Saginaw Creek Watershed

The Saginaw Creek Watershed lies almost entirely within a Timber Management LUD and has a harvest history dating to 1968. Twenty-seven percent of this watershed has been harvested, but only eight percent of the watershed has been harvested within the last thirty years (as of 2005). Early harvest was concentrated in valley bottoms and toe slopes. Harvest in riparian areas totaled 450 acres (Table 3-68). More recent harvest has occurred on mid-slopes and ridge tops (Figure 3-8). There are a total of 20.4 miles of roads in the Saginaw Creek Watershed. Road building in the Saginaw Creek Watershed dates back to the 1960s. Maintenance needs are increasing as the road system and drainage structures age.

Sediment Risk Assessment and Stream Channel Characteristics

The Sediment Risk Assessment for Kuiu Island identified the Saginaw Creek Watershed as having a moderate inherent risk for sediment related changes in stream channel characteristics, compared to other Kuiu watersheds. The risk rating increases to high after accounting for timber harvest and road building. The high SRI indicates that low gradient stream reaches in Saginaw Creek may be susceptible to channel changes such as widening, braiding, or pool filling if sediment supply increases.

The East Fork of Saginaw Creek is in fair condition both for the number of pools and the percentage of channel area in pools; in good condition concerning the width-to-depth ratio; and in excellent condition for wood loading (Table 3-43). The West Fork of Saginaw Creek is in good condition for number of pools; in fair condition for pool area; in excellent condition for wood loading; and in good condition considering the width-to-depth ratio (Table 3-44).

Table 3 - 43. Stream channel condition: East Fork Saginaw Creek

Channel characteristic	Value	Percentile ranking	Condition
Number of pools / kilometer	37.1	Between 25th and 50th	Fair
% channel area in pools	37.9	Between 25th and 50th	Fair
Pieces of wood per 1000 m^2	56.3	Greater than 75th	Excellent
Width-to-depth ratio	20.0	Between 25th and 50th	Good

Table 3 - 44. Stream channel condition: West Fork Saginaw Creek

Channel characteristic	Value	Percentile ranking	Condition
Number of pools / kilometer	48.9	Between 50th and 75th	Good
% channel area in pools	31.8	Between 25th and 50th	Fair
Pieces of wood per 1000 m^2	54.7	Greater than 75th	Excellent
Width-to-depth ratio	20.0	Between 25th and 50th	Good

3.5.2.3 Security Creek Watershed

The Security Creek Watershed lies almost entirely within the Timber Management LUD, and has a harvest history dating to 1974 (Figure 3-8). Twenty six percent (1,546 acres) of this watershed has been harvested (after accounting for road clearings), but only 24 percent has been harvested within the last 30 years. Harvest in riparian areas total 77 acres, or 1.3 percent of the watershed area (Table 3-68). There are a total of 16.1 miles of cataloged roads in the Security Creek Watershed (Table 3-42). Road building in the Security Creek Watershed dates back to the 1960s.

Sediment Risk Assessment and Stream Channel Characteristics

The sediment risk assessment for Kuiu Island identified the Security Creek Watershed as having a moderate inherent risk for sediment related changes in stream channel characteristics, compared to other Kuiu watersheds. After accounting for harvest and road building, the risk rating for sediment-related changes in stream channel characteristics is high. The high SRI indicates that low gradient stream reaches in Security Creek may be susceptible to channel changes such as widening, braiding, or pool filling if sediment supply increases.

Security Creek is in poor condition for the number of pools; in fair condition for the percentage of channel area in pools; and in excellent condition concerning the width-to-depth ratio (Table 3-45). Data for wood loading in Security Creek are not available.

Table 3 - 45. Stream channel condition: Security Creek

Channel characteristic	Value	Percentile ranking	Condition
Number of pools / kilometer	7.1	Less than 25th	Poor
% channel area in pools	39.0	Between 25th and 50th	Fair
Pieces of wood per 1000 m^2	No data	No data	No data
Width-to-depth ratio	27.5	Less than 25th	Excellent

3.5.2.4 Watershed (WS) #109-45-10090

This watershed lies entirely within the Timber Management LUD and has a harvest history dating to 1972 (Figure 3-8). Fifty-nine percent (1266 acres) of this watershed has been harvested (after accounting for road clearings), but only 20 percent of the watershed has been harvested within the last 30 years. Harvest in riparian areas total 85 acres or four percent of the watershed area (Table 3-68). There are a total of 11.6 miles of roads in WS # 109-45-10090 (Table 3-42). Road building in this watershed dates back to the 1960s.

Sediment Risk Assessment and Stream Channel Characteristics

The sediment risk assessment for Kuiu Island identified WS #109-45-10090 as having a very low inherent risk for sediment related changes in stream channel characteristics, compared to other Kuiu watersheds. After accounting for harvest and road building the risk rating for sediment-related changes in stream channel characteristics is moderate.

Stream channel characteristics for Watershed #109-45-10090 are displayed in Table 3-46. This creek is in good condition for the number of pools; in fair condition for the percentage of channel area in pools; in excellent condition for wood loading; and in poor condition concerning the width-to-depth ratio. The good rating for number of pools, and fair rating for percent of channel area in pools indicates that there are many pools, but that they are smaller than average for a stream of this size. This is not likely due to a lack of wood loading in the channel, because wood loading was rated as excellent. Below average pool area and the poor width-to-depth ratio may be related to high sediment loading. While these could be natural characteristics of the stream channel, they may also reflect channel adjustments resulting from landslides—visible on aerial photographs—that likely increased sediment loading in channels upstream.

Table 3 - 46. Stream channel condition: ADF&G stream # 109-45-10090

Channel characteristic	Value	Percentile ranking	Condition
Number of pools / kilometer	49.1	Between 50th and 75th	Good
% channel area in pools	48.1	Between 25th and 50th	Fair
Pieces of wood per 1000 m^2	89.2	Greater than 75th	Excellent
Width-to-depth ratio	35.6	Greater than 75th	Poor

3.5.2.5 Dean Creek Watershed

The Dean Creek Watershed lies entirely within the Timber Management LUD, and has been managed intensively for timber harvest since 1972. In addition, fishpass construction in Dean Creek represents a major investment in fisheries production. Thirty-three percent (1,538 acres) of this watershed has been harvested (after accounting for road clearings), with 31 percent of the watershed having been harvested within the last 30 years (as of 2005) (Figure 3-7). Harvest of riparian areas total 105 acres or 2.2 percent of the watershed area. There are a total of 16.3 miles of cataloged roads in the Dean Creek Watershed (Table 3-42). Road building in the Dean Creek Watershed dates back to the 1970s.

Sediment Risk Assessment and Stream Channel Characteristics

The sediment risk assessment for Kuiu Island identified the Dean Creek Watershed as having a low inherent risk for sediment related changes in stream channel characteristics, compared to other Kuiu watersheds. After accounting for harvest and road building the risk rating for sediment-related changes in stream channel characteristics is moderate.

Stream channel characteristics are displayed in Table 3-47. Dean Creek is in excellent condition for the number of pools and in fair condition for the percentage of channel area in pools; in good condition for wood loading, and in fair condition concerning the width-to-depth ratio. The excellent rating for number of pools, and fair rating for percent of channel area in pools indicates that there are many pools, but that they are smaller than average for a stream of this size. This is not likely due to a lack of wood loading in the channel, because wood loading was rated as excellent. Below average pool area and the poor width-to-depth ratio may be related to high sediment loading. While these could be natural characteristics of the stream channel, they may also reflect channel adjustments resulting from landslides—

visible on aerial photographs—that likely increased sediment loading in channels upstream.

Table 3 - 47. Stream channel condition: Dean Creek

Channel characteristic	Value	Percentile ranking	Condition
Number of pools / kilometer	57.0	Greater than 75th	Excellent
% channel area in pools	37.6	Between 25th and 50th	Fair
Pieces of wood per 1000 m^2	27.1	Between 50th and 75th	Good
Width-to-depth ratio	27.3	Between 50th and 75th	Fair

3.5.2.6 Kadake Creek Watershed

In addition to providing timber, the Kadake Creek Watershed provides recreation opportunities, and is important for fisheries production. The watershed has a harvest history dating to 1972 (Figure 3-8). Nineteen percent (6,151 acres) of this watershed has been harvested (after accounting for road clearings), but just less than 18 percent of the watershed has been harvested within the last 30 years. Riparian harvest totaled 100 acres, or less than one percent of the watershed area (Table 3-68). There are a total of 78.4 miles of roads in the Kadake Creek Watershed (Table 3-42). Road building in the Kadake Creek Watershed dates back to the 1960s.

Sediment Risk Assessment and Stream Channel Characteristics

The sediment risk assessment for Kuiu Island identifies the Kadake Creek Watershed as having a high inherent risk for sediment-related changes in stream channel characteristics, compared to other Kuiu watersheds. The risk rating increases to very high after accounting for harvest and road building. The very high SRI indicates that low gradient stream reaches in Kadake Creek may be susceptible to channel changes such as widening, braiding, or pool filling if sediment supply increases.

Stream channel characteristics are displayed in Table 3-48. Kadake Creek is in poor condition for the number of pools; in excellent condition for the percentage of channel area in pools; and between fair and good condition for wood loading and width-to-depth ratio. The poor rating for number of pools, and excellent rating for percent of channel area in pools indicates that there are few pools, but that they are larger than average for a stream of this size. Both wood loading and width-to-depth ratio are average.

Table 3 - 48. Stream channel condition: Main stem Kadake Creek

Channel characteristic	Value	Percentile ranking	Condition
Number of pools / kilometer	11	Less than 25th	Poor
% channel area in pools	69	Greater than 75th	Excellent
Pieces of wood per 1000 m^2	5	= 50^{th} percentile	Fair / good
Width-to-depth ratio	45	= 50^{th} percentile	Fair / good

3.5.2.7 Rowan Creek Watershed

The Rowan Creek Watershed has a harvest history dating to 1942, with most of the harvest occurring after 1972 (Figure 3-8). Nineteen percent of this watershed has been harvested (after accounting for road clearings), but only about 11 percent of the watershed has been harvested within the last 30 years (as of 2005). Riparian harvest totals 79 acres or less than one percent of the watershed area (Table 3-68). There are a total of 23.5 miles of cataloged roads in the Rowan Creek Watershed (Table 3-42). Road building in the Rowan Creek Watershed dates back to the 1960s.

Sediment Risk Assessment and Stream Channel Condition

The sediment risk assessment for Kuiu Island identifies the Rowan Creek Watershed as having a very high inherent risk for sediment-related changes in stream channel characteristics, compared to other Kuiu watersheds. The rating does not change after accounting for harvest and road building. The very high SRI indicates that low gradient stream reaches in Rowan Creek may be susceptible to channel changes such as widening, braiding, or pool filling if sediment supply increases.

The watershed analysis for the Rowan Creek Watershed (Appendix C of this document) did not include a detailed assessment of stream channel conditions in the main stem of Rowan Creek. This is because more detailed, field based studies were only conducted for watersheds with greater than 20 percent cumulative harvest levels. Consequently, field data on the condition of the major stream draining this watershed are not available. Field investigations of streams draining proposed harvest units did not identify any impaired stream channels in the Rowan Creek Watershed.

3.5.2.8 Watershed (WS) #109-44-10370

The watershed has a harvest dating back to 1983, with a cumulative harvest level of 8.2 percent (Figure 3-8). Riparian harvest totals three acres or less than one percent of the watershed area (Table 3-38). There are a total of 7.0 miles of roads within the watershed.

Sediment Risk Assessment and Stream Channel Condition

The sediment risk assessment for Kuiu Island identifies WS 109-44-10370 as having a very high inherent risk for sediment related changes in stream channel characteristics, compared to other Kuiu watersheds. The rating does not change after accounting for harvest and road-building. The very high SRI indicates that low gradient stream reaches in this watershed may be susceptible to channel changes such as widening, braiding, or pool filling if sediment supply increases.

The watershed analysis for this watershed (part of the Kuiu Island Landscape Assessment (Appendix C of this document)) did not include a detailed assessment of stream channel conditions in this watershed. This is because more detailed, field based studies were only conducted for watersheds with greater than 20 percent cumulative harvest levels. Consequently, field data on the condition of the major stream draining this watershed are not available. Field investigations of streams draining proposed harvest units did not identify any impaired stream channels in this watershed.

3.5.3 Effects Common to all Action Alternatives

3.5.3.1 Direct and Indirect Effects

Each of the proposed action alternatives relies on the existing road system, and no new classified roads are proposed. All of the proposed action alternatives would require the construction of temporary roads, but these would be closed at the completion of harvest activities. This has advantages for protecting water quality and fish habitat by keeping road maintenance needs low, minimizing the potential for sediment delivery to streams from the failure of drainage structures, and by minimizing potential fish passage problems. Some roads that are currently in storage would need to be reconstructed to access timber. All culverts associated with these roads would be removed following the completion of harvest activities.

Clearcut timber harvest and road building both cause an increased risk of landslides, debris flows, and debris torrents (Swanston and Marion 1991, Satterland and Adams 1992, Brardinoni et al. 2002). The increased risk of landslides is considered an indirect effect to streams, because if landslides do occur they may or may not deliver sediment to streams. Minimizing the risk of landslides in clearcut harvest units and where roads are constructed is addressed by applying BMPs and Forest Plan standards and guidelines. Each of the proposed action alternatives would increase landslide potential to some degree. More specific

information about landslide potential is presented below under each alternative and in the Soils and Geology section in this chapter.

3.5.4 Cumulative Watershed Effects

3.5.4.1 Timber Harvest and Water Yield

Timber harvest causes changes in the collection and storage of water in watersheds primarily by affecting canopy interception and evapotranspiration, which can affect the amount of stream discharge. Extensive reduction in plant transpiration rates by vegetation removal can increase annual water yield as well as peak flows in small streams, particularly during the driest part of the growing season (Harr et al. 1975, Jones and Grant 1996). Peak flow increases have been demonstrated in small watersheds where as little as 25 percent of vegetation has been completely removed in a single entry (Jones and Grant 1996). However, increases may be undetectable when harvest levels are below 25 percent (Jones and Grant 1996, Beschta et al. 2000).

Hydrologic recovery due to regrowth of vegetation in harvested areas offsets changes in water yield over time. Full hydrologic recovery in the absence of roads is dependent upon regrowth following harvest, and is expected to require between 10 and 30 years in the Pacific Northwest (Hicks et al. 1991(a), Jones 2000).

Potential changes in water yield are assessed for each alternative in the sections that follow. These qualitative assessments are made assuming 1) that cumulative harvest levels affecting less than 25 percent of total watershed area generally do not cause detectable increases in water yield (Jones and Grant, 1996; Beschta et al. 2000), and 2) that water yield recovers to pre-harvest levels within 30 years (Hicks et al. 1991(a), Jones 2000).

3.5.4.2 General Timber Harvest and Watershed Recovery on Kuiu Island

High rates of timber harvest occurred on Kuiu Island in the 1960s and 1970s, and in the 1980s in the Dean Creek Watershed. Research discussed above suggests that timber harvest levels may have caused temporary increases in landslide potential and water yield during certain time periods, and that recovery to pre-harvest conditions is ongoing. Currently, only the Dean Creek Watershed has 30-year cumulative harvest levels exceeding 25 percent. Regardless of which alternative is selected, 30-year cumulative harvest levels in the project area watersheds will decrease rapidly until the year 2011, after which time the 30-year cumulative harvest levels in all watersheds will be well below 20 percent. More specifically, if the no-action alternative were implemented, the highest 30-year cumulative harvest levels in any watershed would be about 12 percent (Chart 3-2) in 2011. In comparison, if Alternative 4 were selected, the highest 30-year cumulative harvest levels in any watershed would be about 15 percent

(Chart 3-3) by 2011. This calculation accounts for timber harvest that has been approved under the Crane and Rowan Mountain timber sale, but has not yet been logged. The sharp decline in 30-year harvest levels happening between years 2001 and 2011 reflects the sharp decline in harvest rates within the project area since the 1960s and 1970s. What this means for the cumulative watershed effect is that the general trend is toward recovery of slope stability and pre-harvest rates of canopy interception and evapotranspiration. Under the action alternatives the proposed harvest would cause small increases in the 30-year cumulative harvest levels (three percent at the most). However, the overall trend in 30-year cumulative harvest levels is decreasing (Chart 3-2). Cumulative watershed effects are also described below under each alternative.

Chart 3-2 shows how cumulative harvest levels in the project area change over time when a 30-year window is used to calculate cumulative harvest levels. This graph shows how cumulative harvest levels would change over time if the no-action alternative were implemented. This graph does not account for road clearings, but does account for timber harvest that has been approved but not yet implemented.

Chart 3-2. 30-year cumulative harvest levels in major watersheds within the Kuiu Timber Sale Area under Alternative 1

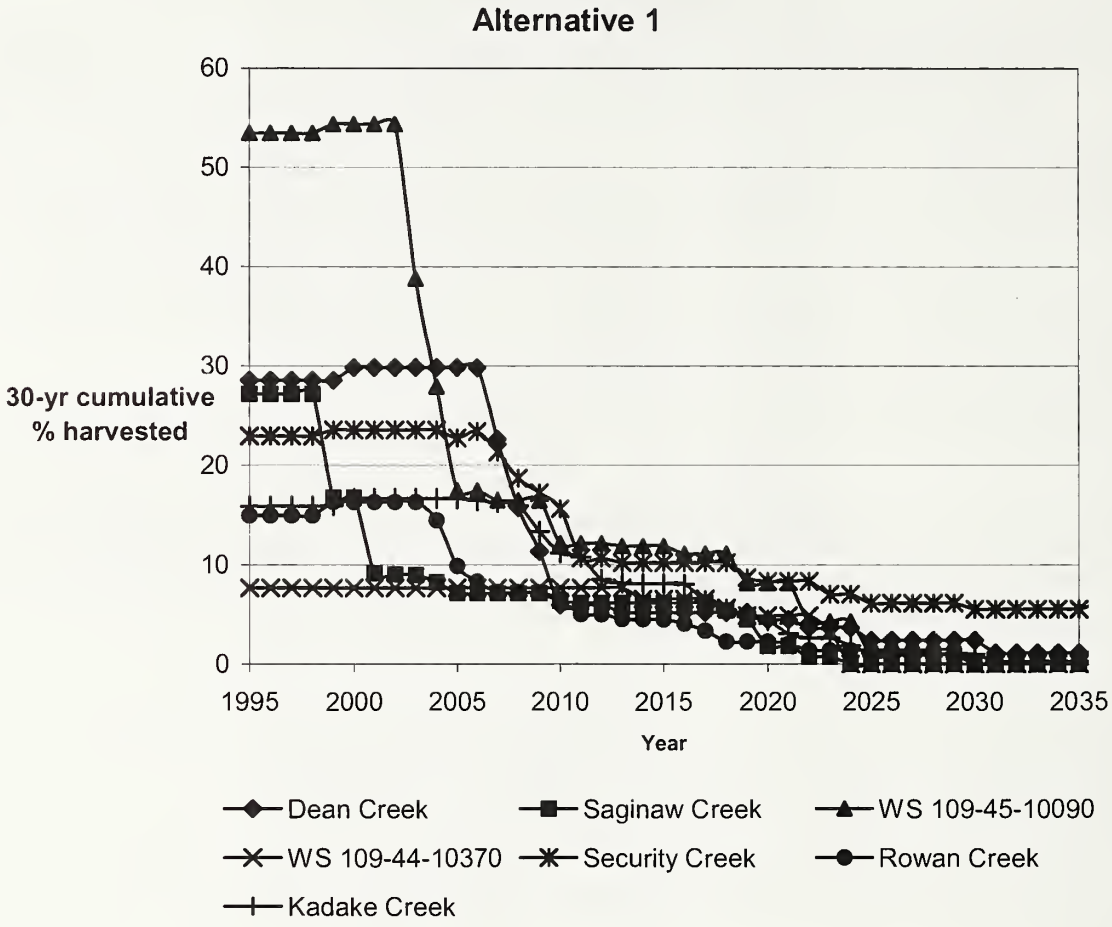


Chart 3-3 shows how cumulative harvest levels in the project area would change over time when a 30-year window is used to calculate cumulative harvest levels. This graph shows how cumulative harvest levels would change over time if the alternative with the most affects Alternative 4, were implemented. All other alternatives would have less effect. This graph does not account for road clearings, but does account for timber harvest that has been approved but not yet implemented.

3.5.4.3 Sediment Risk and Stream Channel Condition in Kuiu Watersheds

Generally, observed stream channel conditions were fair, good, or excellent, except for the poor width-to-depth ratio in watershed 1009-45-10090, and the poor number of pools per kilometer in the Security Creek and Kadake Creek Watersheds. These conditions may be exacerbated if sediment loads are increased in these watersheds.

The current sediment risk index is greater than the inherent sediment risk index in five of the major watersheds within the project area (Table 3-49). This reflects the fact that recent timber harvest has increased the risk of landslides in these watersheds, and that streams in these watersheds may be susceptible to channel changes if landslides do occur. All of the action alternatives would increase the risk of landslides to different degrees, as discussed below under each alternative. Alternative 3 proposes enough timber harvest and road building to further increase the SRI in the Saginaw Watershed (Table 3-49). Alternatives 4 and 5 propose enough timber harvest and road building to increase the SRI in both the Saginaw and Dean Creek watersheds (Table 3-49). Low gradient stream channels in the lower valleys of watersheds with high and very high SRI values may be subject to changes in channel morphology including channel widening, braiding, and changes to channel roughness, grain size, pool depth and pool frequency. This statement is consistent with research on stream channel morphology and stream channel change associated with increased sediment inputs (Lyons and Beschta 1983, Sullivan et al. 1987, Montgomery and Buffington 1997, Madej 1999).

Chart 3-3. 30-year cumulative harvest levels in major watersheds within the Kuiu Timber Sale Area in Alternative 4

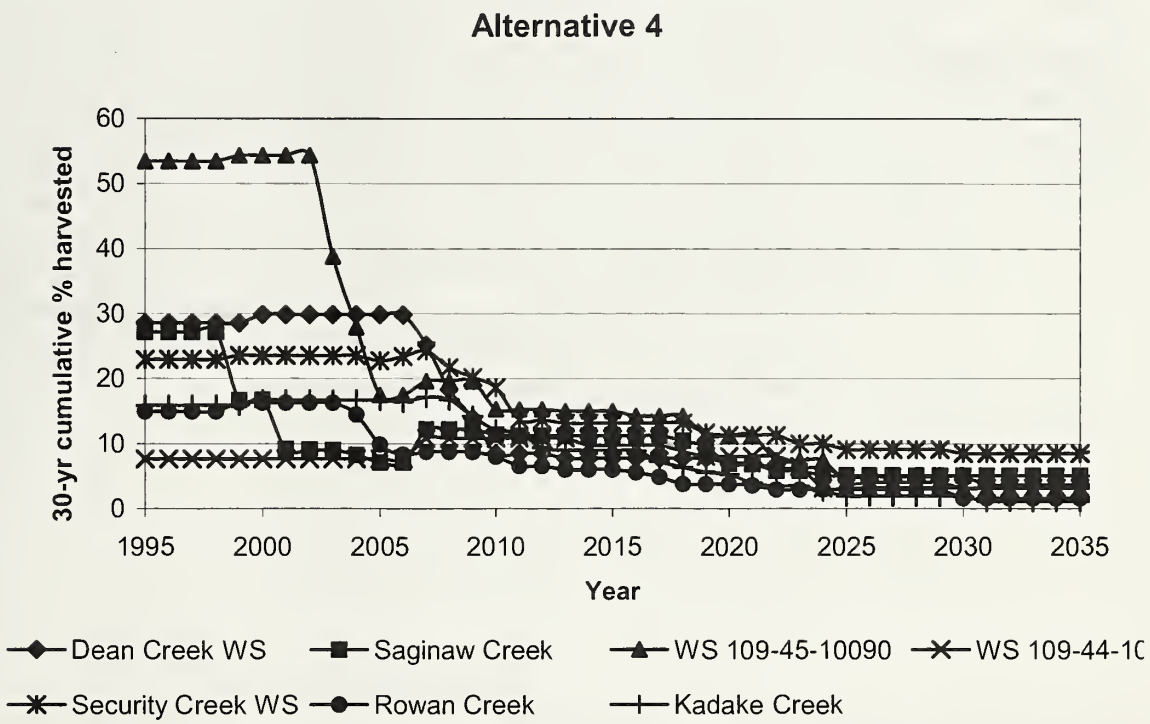


Table 3 - 49. Current Sediment Risk Index (SRI) in project area watersheds, and SRI after accounting for proposed timber harvest and road construction

Watershed	Current SRI	Alt 2 SRI	Alt 3 SRI	Alt 4 SRI	Alt 5 SRI
Dean Creek	Moderate	Moderate	Moderate	High	High
Saginaw Creek	High	High	Very high	Very high	Very high
WS #109-45-10090	Moderate	Moderate	Moderate	Moderate	Moderate
WS #109-44-10370	Very high	Very High	Very High	Very High	Very High
Security Creek	High	High	High	High	High
Rowan Creek	Very high	Very high	Very high	Very high	Very high
Kadake Creek	Very high	Very high	Very high	Very high	Very high

3.5.5 Cumulative Effects of Roads

Each of the action alternatives described in this section respond to the issue of cumulative watershed effects in similar ways. After the completion of proposed harvest activities, all action alternatives would result in a net decrease in the amount of road needing maintenance (Table 3-50). This would be accomplished by placing roads in storage, which involves removing all culverts, excavating additional waterbars in the road surface, and allowing natural revegetation on the road and in the road ditch. This would restore more natural drainage patterns and eliminate the risk of road failures at stream crossings, culvert plugging, and stream diversion. Natural revegetation would further reduce the risk of sediment delivery to streams.

Table 3 - 50. Miles of open roads proposed to be put into storage, by alternative

Watershed	Alternative	Miles of roads with culverts		
		Before	After	Net change
Saginaw Creek	1	10.6	10.6	0
	2	10.6	5.82	4.78
	3, 4, 5	10.6	4.18	6.42
Dean Creek	1, 2, 3	10.11	10.11	0
	4, 5	10.11	9.11	1.0
Watershed # 109-45-10090	1, 3	4.37	4.37	0
	2	4.37	2.97	1.4
	4, 5	4.37	2.87	1.5
Watershed # 109-44-10370	1	6.72	6.72	0
	2, 3, 4, 5	6.72	4.72	2.0
Security Creek	All alternatives	9.88	9.88	0
Kadake Creek	All alternatives	44.76	44.76	0
Rowan Creek	All alternatives	0	0	0

3.5.6 Effects by Alternative

3.5.6.1 Alternative 1 No Action Alternative

Direct and Indirect Effects

In the no action alternative, no timber harvest would occur, and no roads would be built. Selection of this alternative would not preclude regular maintenance of existing roads, including erosion control measures and removal or replacement of culverts. With periodic road maintenance, sediment delivery to streams from roads is expected to be minor, and within water quality standards set by the State of Alaska.

Cumulative Effects

Cumulative effects associated with the no action alternative are limited to those associated with timber harvest activities that have already been approved, the maintenance of existing roads, and the growth of trees in managed stands that have been harvested in the past. Under

this alternative, no changes in water yield, sediment delivery to streams or fish passage are expected beyond those associated with naturally occurring events, or activities analyzed under the Crane and Rowan Mountain Timber Sales (USDA FS 1998). Most of the timber harvest approved under the ROD for the Crane and Rowan Mountain Timber Sales has been implemented. The remainder of the timber harvest would include about 51 acres of harvest in the Dean Creek Watershed, 326 acres in the Security Creek Watershed, 8.5 acres in the Rowan Creek Watershed, and 86 acres in the Kadake Creek Watershed.

3.5.6.2 Alternative 2

Direct and Indirect Effects

Alternative 2 would harvest 491 acres (Table 3-51). Harvest units included in this alternative would be accessed using the existing road system and 2.9 miles of temporary road (Table 3-51). This alternative would also require reconstruction on 4.5 miles of road that are currently in storage. However, these roads would again be placed in storage at the completion of harvest activities. Yarding systems would include only ground-based cable and shovel yarding. This alternative would require the installation of three culverts or bridges on Class I streams, three culverts or bridges on Class II streams, one culvert on a Class III stream, and five culverts or bridges on Class IV streams (Table 3-69). These culverts or bridges would be removed after the completion of harvest activities.

A direct effect of implementing this alternative would be the temporary increase in sediment delivery to streams due to road building, bridge construction, and the installation of culverts. Short term increases in sediment delivery are not expected to degrade water quality or fish habitat.

Alternative 2 proposes 197 acres of clearcut harvest, of which 2.4 acres are on slopes with a high (MMI 3) mass movement index (MMI) (Table 3-52). The proposed timber harvest would increase the risk of landslides occurring on these slopes. These slopes lie in the northeast corner of unit 417 (see unit card Appendix B). Alternative 2 also proposes 13.7 acres of harvest on slopes with an extreme MMI (MMI 4), with a harvest prescription of 50 percent basal area retention. A Soils Stability Investigation Report was completed with a site visit in which it was determined that this area showed no signs of instability and was available for partial harvest. This prescription is expected to effectively mitigate the risk of causing landslides. This alternative does not propose any road building on slopes with a high or extreme MMI.

Table 3 - 51. Summary of timber harvest and road building proposed in Alternative 2, and associated changes in cumulative harvest levels, including areas cleared for roads

Watershed Name	ADF&G Number	WS Acres	Existing Condition	Proposed Activities in Alternative 2			
			Cumulative harvest (%) since 1975	Harvest (ac)	Temp. road (mi)	Temp road[a] (ac)	Cumulative harvest (%)
Dean Creek	109-50-10070	4,690	31.3	0.0	0.0	0.0	31.3
Saginaw Creek	109-44-10390	8,302	8.2	95	0.8	3.9	9.3
Unnamed	109-45-10090	2,140	19.8	24	0.0	0.0	20.9
Unnamed	109-44-10370	4,992	8.2	139	0.0	0.0	11.0
Security Creek	109-45-10100	5,931	23.9	41	0.9	4.3	24.7
Rowan Creek	109-52-10060	13,234	10.6	68	0.2	1.1	11.1
Kadake Creek	109-42-10300	32,270	17.7	124	1.0	4.8	18.1
Total:				**491**	**2.9**	**14.1**	

[a] Assumes a 40-foot clearing width for proposed temporary roads.

Table 3 - 52. Proposed harvest acreage in Alternative 2, by Mass Movement Index class, by watershed

Watershed	Unit	Prescription	MMI 3 (high)	MMI 4 (extreme)
Dean	NA	NA	0	0
Saginaw	NA	NA	0	0
109-45-10090	NA	NA	0	0
109-44-10370	207	50% retention	0	13.7
Security	NA	NA	0	0
Rowan	417	Clearcut	2.4	0
Kadake	NA	NA	0	0
All watersheds			2.4	13.7

Cumulative Effects

Harvest of 491 acres within the project area would increase cumulative harvest levels in the Saginaw Creek, Security Creek, Rowan Creek, and Kadake Creek Watersheds and in watersheds numbered 109-45-10090 and 109-44-10370 (Table 3-51). Dean Creek Watershed (in which no harvest is proposed) would have a 30-year cumulative harvest level above 20 percent (including roads). If Alternative 2 were implemented, and completed by 2007, all watersheds within the project area would have 30-year cumulative harvest levels well below 20 percent in the year 2010.

This alternative addresses cumulative effects associated with roads by placing 8.2 miles of road in storage (Forest Roads 6413 (2.7 miles), 46096 (4.1) miles, and 46021 (1.4 miles)). This would result in a decrease of 4.8 miles of open road in the Saginaw Creek Watershed, 1.4 miles in WS #109-45-10090, and 2.0 miles in WS #109-44-10370. Placing roads in storage involves removing all culverts or bridges, excavating additional waterbars in the road surface, and allowing natural revegetation on the road and in the road ditch. This restores more natural drainage patterns and eliminates the risk of road failures at stream crossings, culvert plugging, and stream diversion. Natural revegetation further reduces the risk of sediment delivery to streams.

3.5.6.3 Alternative 3

Direct and Indirect Effects

Alternative 3 would harvest 794 acres (Table 3-53). Harvest units included in this alternative would be accessed using the existing road system, 7.5 miles of temporary road and 3.2 miles of road reconstruction (Table 3-53). Yarding systems would include only ground-based cable and shovel yarding. This alternative would require the installation of two culverts or bridges on Class I streams, four culverts or bridges on Class II streams, eight culverts or bridges on Class III streams, and 19 culverts or bridges on Class IV streams (Table 3-69). These culverts or bridges would be removed after the completion of harvest activities.

A direct effect of implementing this alternative would be the temporary increase in sediment delivery to streams due to road building, bridge construction, and the installation of culverts. Short term increases in sediment delivery are not expected to degrade water quality or fish habitat.

Alternative 3 proposes 409 acres of clearcut harvest, of which 2.4 acres are on slopes with a high mass movement index (MMI 3) (Table 3-54). The proposed timber harvest would increase the risk of landslides occurring on these slopes. Alternative 3 also proposes about

8.3 acres of harvest on slopes with extreme MMI, with a prescription of 50 percent basal area retention. A Soils Stability Investigation Report was completed with a site visit in which it was determined that this area showed no signs of instability and was cleared for partial harvest. The 50 percent basal area retention prescription is expected to effectively mitigate the risk of causing landslides. This alternative does not propose any road building on slopes with a high or extreme MMI.

Table 3 - 53. Summary of timber harvest and road building proposed in Alternative 3, and associated changes in cumulative harvest levels, including areas cleared for roads

Watershed	ADF&G Number	WS Acres	Existing Condition	Proposed Activities in Alternative 3			
			Cumulative harvest (%) since 1975	Harvest (ac)	Temp Road (mi)	Temp Road (ac) [a]	Cumulative harvest (%)
Dean Creek	109-50-10070	4,690	31.3	0.0	0.0	0.0	31.3
Saginaw Creek	109-44-10390	8,302	8.2	329	2.7	12.9	12.3
Unnamed	109-45-10090	2,140	19.8	0	0.0	0.0	19.8
Unnamed	109-44-10370	4,992	8.2	123	0.0	0.0	10.7
Security Creek	109-45-10100	5,931	23.9	100	1.5	7.4	25.7
Rowan Creek	109-52-10060	13,234	10.6	82	0.1	0.7	11.2
Kadake Creek	109-42-10300	32,270	17.7	160	3.2	15.4	18.2
Total:				794	7.5	36.4	

[a] Assumes a 40-foot clearing width for proposed temporary roads.

Cumulative Effects

Harvest of 794 acres within the project area would increase cumulative harvest levels in the Saginaw Creek, Security Creek, Rowan Creek, and Kadake Creek Watersheds and in watershed number 109-44-10370 (Table 3-53). Of the watersheds within the project area, only Dean Creek Watershed—in which no harvest is proposed—and Security Creek Watershed would have 30-year cumulative harvest levels above 20 percent (including roads).

If Alternative 3 were implemented, increases in cumulative harvest levels in Security Creek may result in slight increases in water yield.

However, any increase in water yield would be short lived due to the ongoing re-growth of trees in stands harvested over a period of decades.

Table 3 - 54. Proposed harvest acreage in Alternative 3, by Mass Movement Index class, by watershed

Watershed	Unit	Prescription	MMI 3 (high)	MMI 4 (extreme)
Dean Creek	NA	NA	0	0
Saginaw Creek	NA	NA	0	0
Unnamed	NA	NA	0	0
Unnamed	207	50% partial harvest	0	8.3
Security Creek	NA	NA	0	0
Rowan Creek	417	Clearcut	2.4	0
Kadake Creek	NA	NA	0	0
All watersheds			2.4	8.3

This alternative addresses cumulative effects associated with roads by placing 8.4 miles of currently drivable roads into storage after accessing units on them; Forest Roads 6413 (2.7 miles), 46096 (4.1 miles), and 6418 (1.6 miles). This would result in a decrease of 6.4 miles of open road in the Saginaw Creek Watershed, and 2 .0 miles in WS #109-44-10370. Placing roads in storage involves removing all culverts or bridges, excavating additional waterbars in the road surface, and allowing natural revegetation on the road and in the road ditch. This restores more natural drainage patterns and eliminates the risk of road failures at stream crossings, culvert plugging, and stream diversion. Natural revegetation further reduces the risk of sediment delivery to streams.

3.5.6.4 Alternative 4

Direct and Indirect Effects

Alternative 4 would harvest 1,425 acres (Table 3-55). Harvest units included in this alternative would be accessed using the existing road system and 19.0 miles of temporary and 6.1 miles of reconstructed road (Table 3-55). Yarding systems would include helicopter yarding, cable yarding, and shovel yarding. This alternative would require the installation of three culverts or bridges or bridges on Class I streams,

five culverts or bridges on Class II streams, 14 culverts or bridges on Class III streams, and 19 culverts or bridges on Class IV streams (Table 3-69). These culverts or bridges would be removed after the completion of harvest activities.

A direct effect of implementing this alternative would be the temporary increase in sediment delivery to streams due to road building, bridge construction, and the installation of culverts. Short-term increases in sediment delivery are not expected to degrade water quality or fish habitat.

Table 3 - 55. Summary of timber harvest and road building proposed in Alternative 4, and associated changes in cumulative harvest levels, including areas cleared for roads

Watershed	ADF&G Number	WS Acres	Existing	Proposed in Alternative 4			
			Cumulative harvest (%) since 1975	Harvest (ac)	Temp road (mi)	Temp road[a] (ac)	Cumulative harvest (%)
Dean Creek	109-50-10070	4,690	31.3	120	1.3	6.3	34.0
Saginaw Creek	109-44-10390	8,302	8.2	421	3.9	18.9	13.5
Unnamed	109-45-10090	2,140	19.8	66	0.9	4.2	23.1
Unnamed	109-44-10370	4,992	8.2	156	0.0	0.0	11.4
Security Creek	109-45-10100	5,931	23.9	176	3.6	17.7	27.2
Rowan Creek	109-52-10060	13,234	10.6	203	2.3	11.0	12.2
Kadake Creek	109-42-10300	32,270	17.7	283	7.0	33.8	18.7
Total:				1,425	19.0	91.9	

[a] Assumes a 40-foot clearing width for proposed temporary roads.

Alternative 4 proposes 1,026 acres of clearcut harvest, of which about 16 acres are on slopes with an extreme mass movement index (MMI 4) (Table 3-56). These slopes are located in Unit 101, both along the western edge of the unit where there are no streams, and in an area drained by Class III and Class IV streams in the southeast corner of the unit (see Unit Card). The proposed timber harvest would increase the risk of landslides occurring on these slopes. This alternative also proposes approximately 36 acres of partial harvest with 50 percent basal area retention on slopes with an extreme MMI. A Soils Stability Investigation Report was completed with a site visit in which it was determined that this area showed no signs of instability and was available for harvest. The partial harvest prescription is expected to

effectively mitigate the risk of causing landslides. This alternative does not propose any road building on slopes with a high or extreme MMI.

Table 3 - 56. Proposed harvest acreage in Alternative 4, by Mass Movement Index class, by watershed

Watershed	Unit	Prescription	MMI 3 (high)	MMI 4 (extreme)
Dean	NA	NA	0	0
Saginaw	303	50% retention	0	10.1
	305	50% retention	0	12.2
109-45-10090	101	Clearcut	0	1.9
109-44-10370	207	50% retention	0	13.7
Security	101	Clearcut	0	13.9
Rowan	NA	NA	0	0
Kadake	A	NA	0	0
All watersheds			0	51.8

Cumulative Effects

Harvest of 1,425 acres within the project area would increase cumulative harvest levels in all watersheds within the project area (Table 3-55). Of the watersheds within the project area, only the Dean Creek and the Security Creek Watersheds would have a 30-year cumulative harvest level above 20 percent (including roads).

If Alternative 4 were implemented, increases in cumulative harvest levels in Dean Creek, Security Creek, and Watershed #109-45-10090 may result in slight increases in water yield. However, any increase in water yield would be short lived due to the ongoing re-growth of trees in stands harvested over a period of decades.

This alternative addresses cumulative effects associated with roads by placing 11 miles of currently drivable roads into storage after accessing units on them; Forest Roads 6413 (2.7 miles), 46096 (4.1 miles), 6427 (1.2 miles), 46021 (1.4 miles), and 6418 (1.6 miles). This would result in a decrease of 6.4 miles of open road in the Saginaw Creek Watershed, 1.1 miles of road in the Dean Creek Watershed, 1.5 miles of road in Watershed #109-45-10090 and 2.0 miles in Watershed #109-44-10370. Placing roads in storage involves removing all culverts or bridges, excavating additional waterbars in the road surface, and allowing natural revegetation on the road and in the road

ditch. This restores more natural drainage patterns and eliminates the risk of road failures at stream crossings, culvert plugging, and stream diversion. Natural revegetation further reduces the risk of sediment delivery to streams.

3.5.6.5 Alternative 5

Direct and Indirect Effects

Alternative 5 would harvest 1,231 acres (Table 3-57). Harvest units included in this alternative would be accessed using the existing road system and 17.1 miles of temporary and 6.9 miles of reconstructed road (Table 3-57). Yarding systems would include only ground-based cable and shovel yarding. This alternative would require the installation of three culverts or bridges on Class I streams, five culverts or bridges on Class II streams, 15 culverts or bridges on Class III streams, and 19 culverts or bridges on Class IV streams (Table 3-69). These culverts or bridges would be removed after the completion of harvest activities.

A direct effect of implementing this alternative would be the temporary increase in sediment delivery to streams due to road building, bridge construction, and the installation of culverts.

Short term increases in sediment delivery are not expected to degrade water quality or fish habitat.

Alternative 5 proposes 1,231 acres of clearcut harvest, of which about 18.3 acres are on slopes with a high or extreme mass movement index (MMI) (Table 3-58). These include about 16 acres of MMI 4 soils in Unit 101; both along the western edge of the unit where there are no streams, and in an area drained by Class III and Class IV streams in the southeast corner of the unit, and on about 2 acres of MMI 3 soils that lie in the northeast corner of unit 417 along a stream. A Soils Stability Investigation Report was completed with a site visit in which it was determined that this area showed no signs of instability and was available for harvest. This alternative does not propose any road construction on slopes with a high or extreme MMI.

Table 3 - 57. Summary of timber harvest and road building proposed in Alternative 5, and associated changes in cumulative harvest levels, including areas cleared for roads

Watershed	ADF&G Number	WS Acres	Existing Condition	Proposed Activities in Alternative 5			
			Cumulative harvest (%) since 1975	Harvest (ac)	Temp Road (mi)	Temp Road[a] (ac)	Cumulative harvest (%)
Dean Creek	109-50-10070	4,690	31.3	120.3	1.3	6.3	34.0
Saginaw Creek	109-44-10390	8,302	8.2	323.9	3.8	18.7	12.3
Unnamed	109-45-10090	2,140	19.8	66.0	0.9	4.2	23.1
Unnamed	109-44-10370	4,992	8.2	133.6	0.0	0.0	10.9
Security Creek	109-45-10100	5,931	23.9	176.3	3.6	17.7	27.2
Rowan Creek	109-52-10060	13,234	10.6	226.4	2.3	11.0	12.4
Kadake Creek	109-42-10300	32,270	17.7	184.4	5.2	25.1	18.4
Total:				1,230.9	17.1	83.0	

[a] Assumes a 40-foot clearing width for proposed temporary roads.

Table 3 - 58. Proposed harvest on MMI3 and MMI4 soils, by watershed and unit in Alternative 5.

Watershed	Unit	Prescription	MMI 3 (high)	MMI 4 (extreme)
Dean Creek	NA	NA	0	0
Saginaw Creek	NA	NA	0	0
Unnamed	101	CC	0	2.0
Unnamed	NA	NA	0	0
Security Creek	101	CC	0	13.9
Rowan Creek	417	CC	2.4	0
Kadake Creek	NA	NA	0	0
All watersheds			2.4	15.9

Kuiu Timber Sale
Figure 3-7
Watersheds and Streams

Legend

- Non-National Forest
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Project Area Boundary
- Existing Roads
- Watershed Boundary

Saginaw Bay
Keku Strait
Security Bay
Dean Creek Watershed
Saginaw Creek Watershed
Watershed 109-45-10090
Watershed 109-44-10370
Kadake Creek Watershed
Kadake Bay
Security Creek Watershed
Rowan Creek Watershed

N

0 0.5 1 2 3 4 Miles

Kuiu Timber Sale

Figure 3-8

Managed Stands, Roads, Landslides

Legend

- Harvested Between 1911-1959
- Harvested Between 1960-1969
- Harvested Between 1970-1979
- Harvested Between 1980-1989
- 1990 - Present
- Non-National Forest
- Streams
- Existing Open Roads
- Project Area Boundary
- 500ft Contour Interval
- Watershed Boundary
- Landslides

Saginaw Bay

Keku Strait

Security Bay

Dean Creek Watershed

Saginaw Creek Watershed

Watershed 109-45-10090

Watershed 109-44-10370

Security Creek Watershed

Kadake Creek Watershed

Rowan Creek Watershed

Kadake Bay

6403 46252 46251 6441 6425 6448 46092 46090 6409 6427 6415 6414 6410 6411 46420 6402 6418 6413 46096 6401 6444 6416 46355 46360 6436 6437 6428 6404 6407

N

0 0.5 1 2 3 4 Miles

E:\kuiu_roads\dp\tbl\arcmap\Dj_4mpd_date mxd 7-21-05 EP

Cumulative Effects

Harvest of 1,231 acres within the project area would increase cumulative harvest levels in all watersheds within the project area (Table 3-57). Of the watersheds within the project area, only the Dean Creek Watershed, the Security Creek Watershed, and Watershed #109-45-10090 would have a 30-year cumulative harvest level above 20 percent (including roads).

If Alternative 5 were implemented, increases in cumulative harvest levels in Dean Creek, Security Creek, and Watershed #109-45-10090 may result in slight increases in water yield. However, any increase in water yield would be short lived due to the ongoing re-growth of trees in stands harvested over a period of decades.

This alternative addresses cumulative effects associated with roads by placing 11 miles of currently drivable roads into storage after accessing units on them; Forest Roads 6413 (2.7 miles), 46096 (4.1 miles), 6427 (1.2 miles), 46021 (1.4 miles), and 6418 (1.6 miles). This would result in a decrease of 6.4 miles of open road in the Saginaw Creek Watershed, 1.1 mile of road in the Dean Creek Watershed, 1.5 miles of road in Watershed 109-45-10090, and 2.0 miles in WS #109-44-10370. Placing roads in storage involves removing all culverts or bridges, excavating additional waterbars in the road surface, and allowing natural revegetation on the road and in the road ditch. This restores more natural drainage patterns and eliminates the risk of road failures at stream crossings, culvert plugging, and stream diversion. Natural revegetation further reduces the risk of sediment delivery to streams.

3.6 Alaska Region Threatened, Endangered, Candidate, and Sensitive Species

3.6.1 Introduction

Federally listed threatened and endangered species are those plant and animal species formally listed by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service under authority of the Endangered Species Act of 1973, as amended. Under the Endangered Species Act, an endangered species is defined as one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as one that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

The Regional Forester of the USDA Forest Service has the authority to designate species as "sensitive." Sensitive species are those plant and animal species for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Information on threatened, endangered, candidate, and sensitive species distributions and occurrences in the Kuiu Timber Sale Area was obtained from agency contacts, a review of the available literature on these species in Southeast Alaska, and field review by interdisciplinary survey teams.

3.6.1.1 Wildlife Species

Table 3-59 displays the potential habitat for the Alaska Region threatened endangered, candidate, and sensitive species wildlife species within the Kuiu Timber Sale Area.

3.6.2 Threatened, Endangered and Candidate Species

The Forest Service consulted with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) as part of this analysis. There are no terrestrial species listed by the USFWS as threatened, endangered, or candidate species that are known to occur within the Kuiu Timber Sale Area. The humpback whale, which returns to feed in Alaska waters during the summer, and the Snake River sockeye salmon, which may occur in the outer waters of the Alexander Archipelago, are listed as endangered by NMFS. Only the humpback whale is known to occur in the vicinity of Kuiu Island. The Northern (Steller) sea lion, the Snake River spring/summer chinook salmon, and the Snake River fall chinook salmon are listed as threatened species by NMFS. There is no critical habitat for these species within or near the Kuiu Timber Sale Area.

Table 3 - 59 Threatened, endangered, and candidate species, and Alaska Region sensitive species potential habitat within the Project area for Kuiu Timber Sale

US Fish & Wildlife Service and National Marine Fisheries Listed Species (T, E, & C)	Potential Habitat in Project Area	Carried Forward For Analysis
Humpback Whale (Endangered)	NO	NO. Habitat or individuals do not occur in action area. Compliance with TLMP standards and guidelines[a]. No effects are expected.
Snake River Sockeye (Endangered)	NO	NO. Habitat or individuals do not occur in action area. Compliance with TLMP standards and guidelines. No effects are expected.
Steller's Sea Lion (Threatened)	NO	NO. Habitat or individuals do not occur in action area. Compliance with TLMP standards and guidelines[a]. No effects are expected.
Snake River Spring/Summer Chinook (Threatened)	NO	NO. Habitat or individuals do not occur in action area. Compliance with TLMP standards and guidelines. No effects are expected.
Snake River Fall Chinook (Threatened)	NO	NO. Habitat or individuals do not occur in action area. Compliance with TLMP standards and guidelines. No effects are expected.
Kittlitz's Murrelet (*Brachyramphus brevirostris*) (Candidate)	NO	NO. Habitat or individuals do not occur in action area.
Alaska Region Sensitive Species	**Potential Habitat in Project Area**	**Carried Forward for Analysis**
Northern Goshawk (*Accipiter gentilis*)	YES	YES
Trumpeter Swan (*Olor buccinator*)	YES	YES
Osprey (*Pandion haliaetus*)	YES	NO. Habitat is outside primary zone of influence.
Peale's Peregrine Falcon (*Falco peregrinus pealei*)	NO	YES

[a] Appendix J of the 1997 Forest Plan Final EIS includes a Biological Assessment for the humpback whale and Steller sea lion that are found in waters of Southeast Alaska. The Forest Plan includes appropriate standards and guidelines for management operations within the waters of Southeast Alaska when these species could be affected, such as in the vicinity of sea lion haul outs.

The U.S. Fish and Wildlife Service is the agency responsible for management of federally listed endangered, threatened, and candidate plant species.

No federally listed threatened or endangered animal species would be adversely affected by the proposed actions. The Forest Service has prepared a complete Biological Evaluation for these species located in the Kuiu Timber Sale planning record.

3.6.2.1 Sensitive Species

The northern goshawk, Peale's peregrine falcon, and trumpeter swan are sensitive species for the Tongass National Forest that may occur in the project area. The Forest Plan provides standards and guidelines for protection of these species. If sensitive species' nests are located, the Forest Plan standards and guidelines will be implemented.

Of the Alaska Region sensitive wildlife species, the northern goshawk, trumpeter swan, and Peale's peregrine falcon are known to occur on Kuiu Island, but only the northern goshawk is documented within the project area. While Kuiu Island has potential habitat for osprey, there is no evidence that this rare migrant to central Southeast Alaska uses Kuiu Island.

Northern Goshawk

The goshawk is a raven-sized raptor associated with forests having tall, dense canopies. These features allow goshawks to hunt beneath the canopy. Goshawks typically forage over a range of 6,000 to 8,000 acres and use many different landscape features (Iverson 1996).

Field surveys have been completed since the 1993 field season following the Regional protocols for the northern goshawk. There are ten known nesting locations on Kuiu Island. One new nesting pair of birds was reported in the medium old-growth habitat reserve on the west side of Security Bay, one nest in Kadake Bay, one in Rowan Creek drainage, four in the Bay of Pillars, and three nests in Elena Bay. The pair in Security Bay came from Prince of Wales Island and relocated to Kuiu during the 1997 nesting season. A pair was sighted in a previous nesting area on Kuiu but no new nesting activity was reported. One pair was nesting in Elena Bay in 2000. No new birds were discovered during the 2004 or 2005 field seasons.

Of the ten nests located, two are within the Kuiu Timber Sale Area. The nest site in the Rowan Bay drainage was first discovered in 1993. It has not
been observed as active since then. The original nesting pair was radio tagged and monitored. The female moved to East Bay of Pillars and the male was found dead in 1995. A male goshawk was seen in 1995,

400 meters from the 1993 nest site, and an adult pair responded aggressively to broadcasted alarm calls. The area was surveyed in 1998, 1999, 2000 and 2002 but no activity was observed. In 2002 the nest was in excellent condition, but there was no evidence of occupation at the base of the tree. The Rowan Creek nest was last checked in 2004, and was unoccupied with the nest structure in poor condition.

The nest in Security Bay was active starting in 1997 and was surveyed in 2003 for goshawk nesting activity, using conspecific broadcasting along a short transect as well as a ground search for evidence of goshawk activity. Two plucks (varied thrush) were found in the vicinity, but no other evidence of goshawk activity was observed. Use of the site by breeding goshawks could not be determined by the survey. The nest was last visited in 2004, and was in poor condition and unoccupied.

The standards and guidelines applied to the management activities proposed in the DEIS would meet the requirements of the Forest Plan. The Rowan Bay nest is protected by a buffer of suitable habitat greater than 100 acres around the nest. The Security Bay nest does not require a buffer as it is located within a medium old-growth habitat reserve and is protected from timber harvest.

The wildlife panel assessments showed that the preferred alternative in the Forest Plan would sustain goshawk habitat across the forest to the end of the planning horizon (FEIS Part 1 p. 3-394). The only silvicultural prescription used in the Forest Plan analysis was even-aged management. The Kuiu Timber Sale Project prescribes both even-aged and uneven-aged management activities in the action alternatives and, depending on which alternative is chosen, these should meet or exceed the requirements found in the Forest Plan.

The harvest of timber in the Kuiu Timber Sale Area may impact individuals or habitat, but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species of the goshawk populations on Kuiu Island and the remaining habitat would maintain a viable population into the future.

Peale's Peregrine Falcon

Thirty-six Peale's peregrine falcon nests have been located in Southeast Alaska, 32 of which are on the Tongass National Forest. Nest surveys are very difficult to conduct, and biologists believe more nests may be present. Peregrine falcon nest distribution is closely associated with large seabird colonies located on the outer coasts or nearby islands. Nest sites are on cliffs from 65 to 900 feet in height and all but one face the open ocean. Seabirds are thought to be major

prey of the falcon. Information on falcon breeding biology or reproduc success is limited; but based on U. S. Fish and Wildlife Service surveys, populations appear to be stable.

There is no known Peale's Peregrine Falcon nesting habitat within the project area. The nearest know nesting habitat is approximately 20 miles south of the project area. Forest Plan standards and guidelines require a 2-mile exclusion zone surrounding a known nest to reduce disturbance. If peregrine falcons are located during any phase of this project, the Forest Plan standards and guidelines will be enforced.

This project is unlikely to adversely impact individual Peale's peregrine falcons or their habitat, and would not contribute to a trend towards federal listing or cause a loss of viability to the Peale's peregrine falcon populations on Kuiu Island.

Trumpeter Swan

The largest nesting population of trumpeter swans on the Tongass National Forest occurs on the Yakutat Forelands. The southernmost nesting population in Alaska occurs in the Chilkat Valley on non-National Forest System lands. Surveys by the U. S. Fish and Wildlife Service indicate the Yakutat population has been stable while the Chilkat Valley population has increased. Trumpeter swans winter in ice-free areas throughout Southeast Alaska. Information on wintering habitats and populations is very limited, but a traditional winter concentration has been documented at Blind Slough on Mitkof Island near Petersburg. Numerous swans from other parts of Alaska migrate through Southeast Alaska, and many may be wintering in suitable habitats in this area.

Forest-wide standards and guidelines for wetlands and riparian areas would apply to these and any newly discovered habitat areas for the swans. Trumpeter swans are not known to nest on Kuiu Island and no known effects to trumpeter swans are likely to occur from this project. All Forest Plan standards and guidelines would be implemented. The Forest Plan standards and guidelines require a ½-mile protection buffer around nesting birds with no development within known nesting areas.

Winter trumpeter swan habitat is adjacent to the project area. However, because of the topography (a mountain range lies between the management activities and the wintering swan habitat) no disturbance is expected. This project is not likely to impact individuals or habitat, and is not likely contribute to a trend towards federal listing or cause a loss of viability to the trumpeter swan populations on Kuiu Island. The remaining habitat will maintain a viable population into the future.

3.6.3 Threatened, Endangered and Candidate Plant Species

In the State of Alaska, one plant species is federally listed: the endangered fern *Polystichum aleuticum*, known only from Adak Island in the Aleutians. No federally listed or proposed plant species are known or suspected to occur on Kuiu Island.

3.6.3.1 Sensitive Listed Plant Species

Plant surveys for sensitive listed plants are routinely conducted in areas where projects are proposed. Much of north Kuiu Island has been surveyed over the last several years prior to such proposed projects, the most recent surveys being conducted in 2003 and 2004. These surveys record all vascular plants encountered, not just sensitive plants. This provides a comprehensive list of all species found in the habitats surveyed.

The Alaska Region lists 19 plant species as sensitive. Twelve Forest Service listed sensitive plant species are known or suspected to occur on the Petersburg Ranger District of the Tongass National Forest where the Kuiu Timber Sale Area is located (Figure 1 – 1 and Table 3-60). More information is in the Biological Evaluation located in the Kuiu Timber Sale planning record.

Three sensitive listed plants have been found on the Petersburg Ranger District; two of those are known on Kuiu Island. Loose-flowered bluegrass (*Poa laxiflora*) has been documented on several upper beaches in the wilderness areas 15-20 miles south of the project area and along one stream on north Kuiu within the project area. Davy mannagrass (*Glyceria leptostachya*) has been found along a stream bank near the Affleck Portage Trail, which is about 25 miles south of the project area. The third sensitive species found on the Petersburg Ranger District is Wright filmy fern (*Hymenophyllum wrightii*). It has only been found on Mitkof Island in the 1960s.

Sensitive plant surveys for the Kuiu Timber Sale Area were conducted during the summers of 2003 and 2004. These surveys were mainly conducted in mature spruce/hemlock forests where harvest units were proposed. Habitats and microsites within the units and roads where sensitive plants were most likely to be found were targeted in the surveys. These sites included wet seeps, wet meadows, streambanks, and rocky areas. Also, dark, damp areas on downed logs and at the base of trees were searched for Wright filmy fern. Areas with limestone substrates were also targeted in the surveys. A total of 24 proposed units were surveyed. Identified road corridors within the surveyed units were also surveyed. In addition, the proposed

new road to Unit 402, which is outside any proposed harvest units, was surveyed for sensitive listed plants. Only one sensitive listed plant was found, loose-flowered blue grass (*Poa laxiflora*), along a stream below Unit 307. The population consisted of about 25 individual plants on a rocky area near the edge of the stream. The plants are within the riparian buffer on the stream so they are not within a proposed harvest unit. Unit 307 is proposed in Alternatives 3, 4 and 5.

Table 3 - 60. Current Alaska Region sensitive plant species known or suspected to occur on Petersburg Ranger District

Common Name	Scientific Name	Habitat description
Goose-grass sedge	*Carex lenticularis var. dolia*	Wet meadows, snowbed edges, and lakeshores in alpine areas
Edible thistle	*Cirsium edule*	Wet meadows (muskegs) and open forests
Davy mannagrass	*Glyceria leptostachya*	Wet areas, usually along streams, ponds, and lake margins
Wright filmy fern	*Hymenophyllum wrightii*	On the base of trees and rock outcrops in damp humid woods
Truncate quillwort	*Isoetes truncata*	Immersed in shallow freshwater pools
Calder lovage	*Ligusticum calderi*	Alpine and margins of subalpine and mixed conifer stands, on limestone
Bog orchid	*Platanthera gracilis*	Wet meadows and wet open habitats
Loose-flowered bluegrass	*Poa laxiflora*	Moist lowland woods, open-forested meadows, upper beaches, along streams
Kamchatka alkali grass	*Puccinellia kamtschatica*	Wet places and sea beaches
Unalaska mist-maid	*Romanzoffia unalaschcensis*	Rock outcrops, along streambanks, beach terraces, and open rocky areas
Queen Charlotte butterweed	*Senecio moresbiensis*	Alpine and subalpine with open, rocky, or boggy slopes, grassy talus slopes, or rocky heaths. Usually on limestone
Circumpolar starwort	*Stellaria ruscifolia spp. aleutica*	Moist gravelly sites and along creeks in mountains

The one sensitive listed plant species found within the project area would not be affected by the proposed alternatives since it is within a riparian buffer along a stream that is outside any proposed harvest units or proposed road construction or reconstruction. The nearest proposed units are Units 307 and 308 which are across the stream and uphill from the site. These units are proposed in Alternatives 3, 4, and 5.

3.6.4 Conclusions

3.6.4.1 Direct and Indirect Effects

Wildlife Species

There would be no measurable direct effects on any threatened, endangered, or sensitive species other than the goshawk for any of the alternatives. For goshawk, proposed timber harvest and road building activities in the project area may impact individuals but are not likely to cause a trend toward federal listing or a threat to population viability. Goshawk nesting and foraging habitat would be reduced in all action alternatives. Indirect effects may include reduction of prey species habitat for goshawk as a result of old-growth habitat fragmentation. Application of Forest Plan standards and guidelines will ensure that no known goshawk nest sites would be disturbed by any of the proposed activities.

Plant Species

The proposed timber harvest activities in the Kuiu Timber Sale Area would not have any direct, indirect, or cumulative effects on threatened, endangered, and sensitive listed plant species.

3.6.4.2 Cumulative Effects

The Forest Plan projected that VCUs that reached a harvest level of at least 47 percent of their original productive old-growth (POG) may have an elevated risk of not sustaining goshawks in the VCU, unless at least 6,700 acres of POG remained in the VCU. Fifty-one VCUs representing approximately 7.5 percent of the species' range on the Tongass were projected to reach this level of harvest by 2095 (Forest Plan FEIS Appendix N, pages N-39 and N-40, and Appendix 15). VCUs 399, 400, 402, and 421 are not a part of this list. The Forest Plan estimated that at least 54 percent of the forested land would remain unharvested by the end of the 100 year rotation within these VCUs. Therefore, the cumulative effects of projects within the project area would not contribute to a trend towards federal listing or cause a loss of viability to the population or species of the goshawk populations.

3.7 Timber and Vegetation Resources

3.7.1 Introduction

The Kuiu Timber Sale Area is a mosaic of coniferous forests interspersed with muskeg, scrubland, and alpine plant communities. The forests are primarily western hemlock with a Sitka spruce component and scattered Alaska yellow-cedar. Higher percentages of Sitka spruce are found along streams and other well-drained sites. The understory shrubs are blueberry, huckleberry, and rusty menziesia. Many species of vascular plants, lichens, and mosses occur throughout all habitat types. Forested muskeg with a high percentage of yellow-cedar occurs throughout the project area especially in the lower elevations. Alder is found on disturbed sites such as roadsides, managed stands and along stream banks. Muskegs support shore (lodgepole) pine.

3.7.2 Project Area Land Description

The project area is within the Rowan Sediments and North Prince of Wales-Kuiu Carbonates ecological subsections as described in *Ecological Subsections of Southeast Alaska and Neighboring Areas of Canada* (Nowacki et al 2001). Specifically, the project area is located in the north central portion of Kuiu Island.

The western portion of the project area is in the Rowan Sediments area, which has long, smooth, forested hillslopes, dissected by broad U-shaped glacial valleys. The eastern portion of the project area is in the North Prince of Wales-Kuiu Carbonates area, which has surfaces that undulate irregularly, and possess unique topographic oddities including vertical shafts and cliffs.

3.7.3 Plant Associations

Forest vegetation has been categorized using the *Preliminary Forest Plant Associations of the Stikine Area, Tongass National Forest* (Pawuk and Kissinger 1989), which describes potential climax plant communities that may develop over time in response to soil, climate, plant geography, and evolution. This classification system assists land managers and resource specialists in predicting the outcome of various vegetative manipulations. Chart 3-4 displays the relative percentages of the different plant associations found in the Kuiu Timber Sale Area.

Forest Plant Association Series

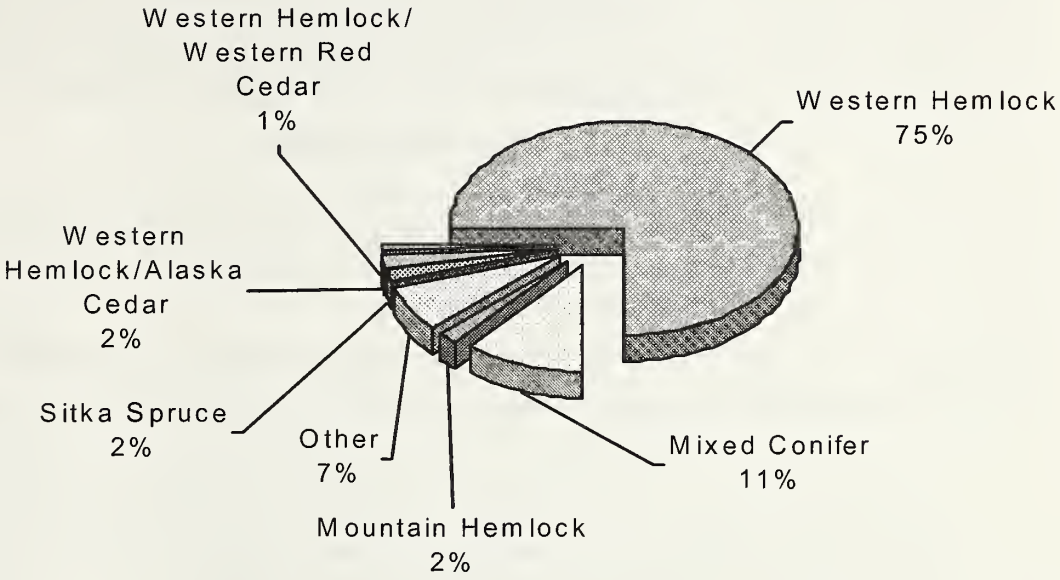


Chart 3-4. Plant series in the Kuiu Timber Sale Area

3.7.3.1 Western Hemlock

The Western Hemlock series is dominated by western hemlock with Sitka spruce being a minor component. This series has moderate productivity and generally provides a well-developed stand structure for wildlife habitat, including both snow intercept and browse for wildlife.

3.7.3.2 Western Hemlock-Alaska-Cedar

The Western Hemlock-Alaska-Cedar series is characterized by the presence of both western hemlock and Alaska yellow-cedar in the overstory. Western hemlock is normally more abundant but Alaska yellow-cedar is always present.

3.7.3.3 Sitka Spruce

The Sitka Spruce series is characterized by a mixture of Sitka spruce and western hemlock in the overstory. Sitka spruce is usually dominant, especially in younger stands. This series typically occurs on sites with re-occurring soil disturbance.

3.7.3.4 Mixed Conifer

The Mixed Conifer series has a low to very low productivity, with stunted tree heights. This series includes western hemlock, Sitka Spruce and Alaska yellow-cedar. This series provides important wildlife habitat for many species. Blueberry forage production and production of persistent forbs is high. Snow interception is poor, with little or no forage for wildlife during winters with heavy snowfall. This association is primarily found next to muskegs.

3.7.3.5 Mountain Hemlock

The Mountain Hemlock series which is usually found at higher elevations has moderate productivity. It is important summer range for wildlife species but is very poor winter range due to extreme cold temperatures and deep snow.

3.7.3.6 Western Hemlock-Western Redcedar

The Western Hemlock-Western Redcedar series is characterized by the presence of both western hemlock and western redcedar in the overstory. These tree species are typically present in similar proportions as co-dominant species. Other species do not occur or are a minor component of the overstory. Western redcedar is usually, but not always present in the understory.

Table 3 - 61. Species composition of forest lands in the Kuiu Timber Sale Area

Species	Percent Volume
Western hemlock	82 %
Sitka spruce	16 %
Alaska cedar	2 %
Western redcedar	0

3.7.4 Species Composition

Table 3-61 and Table 3-62 display the species composition by volume for productive forest land in the Kuiu Timber Sale Area and the species composition in proposed harvest units for each action alternative. None of the proposed alternatives are expected to have an adverse effect on the quantity or composition of cedar (or any species) in the future. If regeneration surveys indicate that natural regeneration is inadequate, planting of cedar would be applied to ensure adequate stocking is maintained as described in the silvicultural prescription. Since both western redcedar and Alaska yellow-cedar are shade intolerant, overstory removal of hemlock could release cedar if

advanced regeneration is present. Thinning and pruning of second growth stands typically benefit cedar.

Table 3 - 62. Timber volume by species in the Kuiu Sale Area proposed harvest units (mbf)

Species	Alternative				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Sitka Spruce	N/A	2,574	4,129	7,468	6,339
Hemlock	N/A	11,794	19,098	34,585	29,376
Alaska Yellow-Cedar	N/A	204	359	596	576
Western Redcedar	N/A	0	0	0	0
Total (mbf)	**N/A**	**14,572**	**23,586**	**42,649**	**36,291**

3.7.5 Forest Land Classification

National Forest System lands are defined by vegetative cover, soil type, and administratively designated land use. This classification scheme is intended to show the amount of land that is covered by forest vegetation, with further divisions to show the amount of that land that is capable of commercial timber production. Chart 3-5 shows the National Forest System land classifications in the Kuiu Timber Sale Area.

3.7.5.1 Non-Productive Forest Land

Non-productive forest land comprises about 16 percent of the National Forest System (NFS) land in the Kuiu Timber Sale Area. Non-productive forest land is forested land that does not support enough timber volume to meet the criteria for productive forest land.

3.7.5.2 Forested Land

These lands comprise about 98 percent of the NFS land in the Kuiu Timber Sale Area. Forested land has at least ten percent occupied by forest trees of any size or formerly having had such a tree cover and not developed for non-forest use.

3.7.5.3 Non-Forest Land

Non-forest land comprises about two percent of the NFS land in the Kuiu Timber Sale Area. Non-forested land has less than ten percent of the area occupied by forest trees of any size, or formerly had such a tree cover and is now developed for non-forest use.

3.7.5.4 Productive Forest Land

These lands comprise about 89 percent of the NFS land in the Kuiu Timber Sale Area. Productive forest lands have timber volumes of greater than or equal to 8,000 board feet/acre or have the potential to achieve this volume and are capable of maintaining that volume. This land is capable of producing 20 cu ft/acre/year of industrial wood or has a site index of 40. Productive forest land does not necessarily mean that the stand is within the timber base of lands that are available for commercial timber harvest.

3.7.5.5 Suitable Forest Land

These lands were determined to be suitable for timber production. Within those areas of productive forest land some land was removed from the suitable timber base due to Forest Plan standards and guidelines. Appendix A of the Forest Plan describes the process that was used to identify suitable forest land. About 78 percent of the productive forest land in the Kuiu Timber Sale Area is classified as suitable for timber production.

3.7.5.6 Unsuitable Forest Lands

No commercial timber harvest is allowed on these lands. Land on slopes greater than 72 percent that have unstable soils and areas within riparian, beach and estuary buffers are examples of forest land classified as unsuitable for timber production. About 22 percent of the productive forest land in the Kuiu Timber Sale Area is classified as unsuitable for timber production.

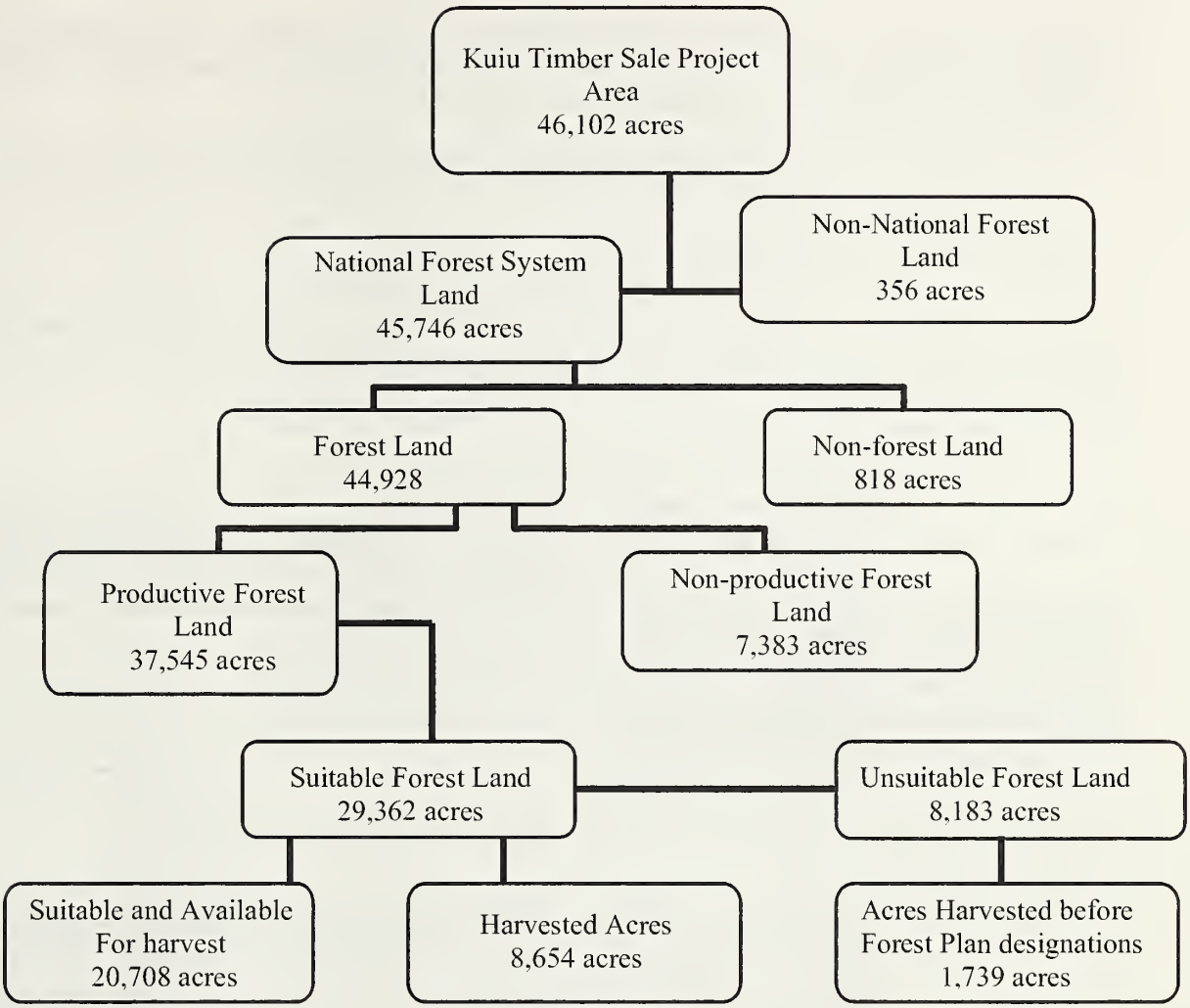


Chart 3-5. Forest land classification in the Kuiu Timber Sale Area

3.7.6 Volume Classification

3.7.6.1 Volume Strata

The Forest Plan adopted a volume strata classification system for estimating volumes. This strata system was used for estimating timber volumes and vegetation structure in the Kuiu Timber Sale Area. The strata system combines the existing timber inventory volume classes with additional information on soils and slope to group the strata. These volume strata are grouped as follows:

High Volume Strata are areas within mapped timber inventory volume classes 5, 6, and 7 on non-hydric soils, and on hydric soils with slopes greater than 55 percent.

Medium Volume Strata are areas within mapped timber inventory volume classes 5, 6, and 7 on hydric soils with slopes less than or

equal to 55 percent and areas within mapped timber inventory volume class 4 that are either on non-hydric soils, or are on hydric soils with slopes greater than 55 percent.

Low Volume Strata are areas within mapped timber inventory volume class 4 on hydric soils with slopes less than or equal to 55 percent.

Timber volumes for the Kuiu Timber Sale are based on stand exams performed in 2003 and 2004 (Tables 3-63 and 3-64). Actual timber volume to be harvested would be determined from a timber cruise prior to advertisement of the timber sales offered.

Table 3 - 63. Volume strata in the Kuiu Timber Sale Area

Strata	Average Vol/Acre[a]	Productive Forest Acres[b]	Suitable Acres
Low	16.9 mbf	650	454
Medium	24.1 mbf	5,211	3,790
High	29.3 mbf	21,251	16,082

[a]Sawlog and utility mbf/acre

[b] does not included non productive forest acres in planning area

Table 3 - 64. Volume strata acres harvested by alternative

Strata*	Acres in Project Area	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
High	21,251	0	402	629	1,189	947
Medium	5,211	0	64	133	183	229
Low	650	0	18	21	30	30

* Does not include non productive forest acres within project area or units.

3.7.7 Timber Resources

About 93 percent of the project area acres have been assigned to land use designations (LUDs) that allow commercial timber harvest. The remaining acres are allocated small old-growth habitat reserves (OGRs), (three percent) and Recreational River LUD (three percent). The remaining one percent is non-National Forest System land within the project area). Of the LUD acres that allow timber harvest, approximately 29,362 are suitable for timber harvest according to the Forest Plan.

There are 16,837 acres of productive forest lands currently excluded from timber harvest within the project area due to resource protection measures, prior timber harvest, or land use designation. The remaining 20,708 acres of productive forest lands are currently suitable and available for timber harvest.

Based on averages for the Petersburg Ranger District, volume classification for the suitable and available productive forest land is displayed in Table 3-65.

Detailed explanations of the rationale for considering timber harvest in the Kuiu Timber Sale Area and market demand for wood products is located in Appendix A of this document. More information can also be found in the Forest Plan FEIS, Part 1 (pages 3-248 to 3-307).

Table 3 - 65. Suitable and available productive forest land strata and volume estimates

Volstrata	Percentage	Acres	Sawlog mbf/ac	Sawlog mmbf	Sawlog & utility mbf/acre	Sawlog & Utility mmbf
Low	2%	454	16.9	27	18.9	31
Medium	18%	3,790	24.1	123	27.5	140
High	78%	16,082	29.3	482	33.4	549
None[a]	2%	382				
Total	**100%**	**20,708**		**632**		**720**

[a]none acres are "holes" in the GIS layer and represent forested areas of unknown volume quality or small inclusions of non forest land

3.7.8 Silvicultural Systems

Silvicultural systems are used to manage, harvest, and re-establish stands of forest trees for the purpose of meeting certain objectives. Silvicultural systems have been developed to produce more valuable commercial timber at a faster rate, maintain wildlife habitat, and either maintain or enhance scenery values. No single silvicultural system for a forest stand can be used to achieve all the desired combinations of amenities and products. Instead, a variety of treatments applied over the Kuiu Timber Sale Area would result in a mosaic of stands for different uses. Three silvicultural systems and three harvest methods were considered for the project area. Many times the proposed treatments are designed to emulate natural disturbance.

The Forest Plan (Appendix G) provides detailed information about the silvicultural systems recommended for the Tongass National Forest. The systems considered for the Kuiu Timber Sale are:

- uneven-aged management which results in a stand with younger trees interspersed with older trees, either in clumps or distributed across the stand,
- even-aged management which results in the conversion of mature stands to faster growing stands of a single age, and
- two-aged management which results in a seedling stand with varying levels of older-aged residual trees.

The post-harvest conditions of the forest stand for all systems are dependent upon the existing plant community, the retained canopy structure, and advanced regeneration. Species composition is monitored to ensure that the mix of species is roughly the same as expected on the existing site.

The Kuiu Timber Sale analysis used a variety of silvicultural systems tailored to site-specific objectives. The objectives include:

- retaining stand legacy or old-growth characteristics to maintain biodiversity,
- economics and logging feasibility,
- protection of the soil, watershed, wildlife habitat, and scenery characteristics of the project area, and
- production of wood-fiber for future human use.

A complete silvicultural prescription for the entire length of the rotation will be written for each stand selected for harvest. These prescriptions provide guidance for treatments following the proposed timber harvest for this project, including subsequent entries, thinning, and pruning.

3.7.8.1 Even-aged Systems

An even-aged system harvests all merchantable trees and produces stands that consist of trees of the same or nearly the same age. A stand is even-aged if the range in tree ages normally does not exceed 20 percent of the rotation age (the age at which the stand is harvested). Reasons for using even-aged systems include:

1) their compatibility with the use of standard logging systems,

2) their favorable harvest economics,

3) their effectiveness in controlling disease such as hemlock dwarf mistletoe, and

4) their creation of favorable conditions for the regeneration of Sitka spruce (Forest Plan, pages 4-96 – 4-97).

Stands regenerated by even-aged systems develop through distinct stages. There are even-aged stands of various ages and sizes distributed throughout the managed forest. The system produces a stand-developmental sequence much like that which follows stand replacement events such as catastrophic windthrow, landslides, or avalanches. The sequence may include dense seedlings and saplings, thinned saplings, poles, small diameter trees, medium diameter trees, and large diameter trees. Consequently, even-aged forests have relatively low diversity within a site, but they have a high degree of diversity across the landscape. Even-aged systems may require some modification to provide for other resource considerations and needs, such as reserve trees for wildlife. These reserve trees are generally carried to the end of the stand rotation.

3.7.8.2 Two-aged System

This system is designed to maintain and regenerate a stand with two age classes. The resulting stand may be two-aged or trend toward the uneven-aged condition as a consequence of both an extended period of regeneration establishment and retention of reserve trees that may represent one or more age classes. The reserve trees provide structural diversity and a biological legacy. Two-aged management regimes can produce stands of greater structural diversity than even-aged management. This method may be used where windthrow or disease are not major threats or can be tolerated (Forest Plan, p. 4-98). In some areas, windthrow or damage to residual trees can be tolerated because the dead or fallen trees would continue to provide structure and wildlife habitat. These stands would not be reentered for harvest until the next rotation in approximately 100 years.

The residual stands left in the Kuiu Timber Sale units would have an average of 50 percent of the pre-treatment basal area, based on standing green trees that constitute a distinct age class separated in age by more than 20 percent of the rotation. Retention may be in clumps or as individual trees. Reserves or clumps would be distributed somewhat evenly across the harvest unit or stand, and away from the unit boundary.

3.7.8.3 Uneven-aged System

This system regenerates and maintains a multi-aged structure by removing some trees in all size classes either singly, in small groups, or in strips. Uneven-aged management maintains or creates a stand with trees of three or more distinct age (size) classes, either intimately mixed or in small groups. The remaining structure provides wildlife habitat and reduces visual impacts. The next entry into these stands

would be in approximately 75 years when 25 percent of the stands basal area would be removed in patches or in single trees.

3.7.9 Silvicultural Prescriptions

Silvicultural prescriptions for the Kuiu Timber Sale were developed by a silviculturist to meet the objectives identified by the interdisciplinary planning team. The objectives for the proposed timber harvest units include: (1) timber sale economics, (2) future timber production, (3) wildlife habitat, (4) soil stability, (5) scenic viewshed, (6) watershed stream channel stability, and (7) minimizing logging system damage to residual trees.

Prescriptions for the even-aged and two-aged management systems cover the entire rotation to provide guidance for intermediate treatments that may follow the harvests, including thinning and pruning. Prescriptions for the uneven-aged management system include the next entry into the stand; in approximately 75 years (see the discussion in the previous section). However, they are subject to change if the management direction changes, such as through Forest Plan amendments or a new Forest Plan. Table 3-66 displays the silvicultural prescriptions and yarding systems proposed for the Kuiu Timber Sale Area alternatives. Additional information on these project-specific prescriptions may be found in the introduction to unit cards in Appendix B.

3.7.9.1 Even-aged Management (Clearcutting)

Even-aged management (clearcutting) is the cutting of all the trees in one harvest entry, which produces a fully exposed microsite for the development of a new age class. The objectives of this system are: (1) to create favorable timber sale harvest economics and increase logging feasibility, and (2) to create a fast-growing stand of trees to maximize wood fiber production. These stands regenerate into a mostly single-aged stand. Where this treatment is recommended, it has been determined that it is optimal for the site and the resulting openings do not exceed 100 acres, in compliance with the National Forest Management Act. The harvest action chosen to achieve this treatment is clearcutting.

The desired future condition is an even-aged stand of the same species composition as the original stand that mimics the results of a large naturally-occurring wind event. Except for reserve trees, all trees greater than nine inches DBH would be harvested in the cable and shovel units. Natural regeneration is expected to be abundant. Reserve trees would be retained to meet site-specific resource objectives, including (1) Stream Channel Best Management Practices, and (2) high soil hazard areas as identified in the Soils section of this chapter. Natural regeneration is expected to contribute to the stand being fully stocked with seedlings within three years of the regeneration harvest.

Clearcutting is prescribed for all units where there are no other conflicting resource issues and so that residual trees are not damaged by traditional logging systems. Where resource issues are anticipated, damage to trees left within the unit and lower commercial stand productivity are acceptable resource tradeoffs.

Table 3 - 66. Acres[a] of silvicultural prescriptions by alternative

Silvicultural System	Yarding System	Alt 2	Alt 3	Alt 4	Alt 5
Even-aged Management					
Clearcut	Shovel	10	12	118	149
	Cable	187	397	908	1082
Total acres even-aged management		197	409	1,026	1,231
Uneven-aged Management					
Single Tree Selection, 50% BA retention	Helicopter	0	0	170	0
	Cable	87	72	45	0
Group Selection, 50% BA retention	Cable	19	19	42	0
Total acres uneven-aged management		106	91	257	0
Two-aged Management					
Clearcut with reserves 50% BA retention	Cable	115	271	113	0
	Shovel	73	23	29	0
Total acres even-aged management		188	294	142	0

[a]These are gross acres and include the entire unit size and not actual acres harvested within the units.

3.7.9.2 Two-aged management - clearcut with reserves

Objectives of this prescription are to: (1) retain trees for scenic values in recreational river corridors, (2) retain additional habitat where heavy use by wildlife is evident, and (3) retain structural diversity and a biological legacy.

The desired future condition is a two-aged stand of the same species composition as the original stand. Natural regeneration is expected to be abundant.

The two criteria for two-aged management would be met for density and distribution of created openings.

Operational feasibility and safety would be considered when selecting reserve tree clumps or groups. It is recognized that where two-aged management is applied to areas of high windthrow risk, there may be some windthrow in the leave trees. This risk is tolerated because if blowdown occurs, the trees would still have benefits to wildlife and would still contribute to stand structure.

Stands proposed for this system would have approximately 50 percent of the basal area of the merchantable trees (trees greater than 9 inches in diameter) harvested in the form of patches ¼-acre to one acre in size or individually where feasible. This would create a stand of two or more distinct age (size) classes.

This system would provide foraging areas interspersed with cover. T large trees provide habitat for cavity nesters, and snow interception.

The appearance of the residual stand mimics natural blowdown patches and single trees. Damage to leave trees and lower commercial stand productivity are acceptable resource tradeoffs to achieve these goals.

The next entry would be in approximately 100 years. All reserve trees would be maintained throughout the entire rotation. Intermediate treatments that follow the harvests may include thinning and pruning.

3.7.9.3 Uneven-aged management - Group selection

Objectives of this prescription are to: (1) retain trees for scenic values in the recreational river corridor, (2) retain additional habitat where heavy use by wildlife is evident, and (3) retain structural diversity and a biological legacy.

The desired future condition is a stand with three or more distinct size classes resulting in an uneven-aged stand. Natural regeneration is expected to be abundant.

Stands proposed for this system have approximately 50 percent of the basal area of the trees remaining after harvest. Merchantable trees (trees greater than nine inches in diameter) would be harvested in

small patches to form a mosaic of irregularly shaped openings within the stand. Each group harvested consists of a mixture of tree sizes. Each harvested opening regenerates, creating a patch of trees of uniform age and height. These groups provide small foraging areas interspersed with cover. The large trees provide habitat for cavity nesters. The appearance of the residual stand mimics natural blowdown patches. Damage to leave trees and lower commercial stand productivity are acceptable resource tradeoffs to achieve these goals.

Operational feasibility and safety would be considered when selecting reserve tree clumps or groups. It is recognized that where uneven-aged management is applied to areas of high windthrow risk, there may be some windthrow in the leave trees. This risk is tolerated because if blowdown occurs, the trees would still have benefits to wildlife and would still contribute to stand structure.

Stands proposed for this system would have approximately 50 percent of the basal area of the merchantable trees (trees greater than 9 inches in diameter) harvested in the form of patches ¼ to 1 acre in size or individually where feasible. This would create a stand of three or more distinct age (size) classes.

This system would provide foraging areas interspersed with cover. The large trees provide habitat for cavity nesters and snow interception. The appearance of the residual stand mimics natural blowdown patches and single trees. Damage to leave trees and lower commercial stand productivity are acceptable resource tradeoffs to achieve these goals.

The next entry into these stands would be in approximately 75 years when 25 percent of the stand's basal area would be removed in patches or in single trees.

3.7.9.4 Uneven-aged management- single tree selection

Objectives of this prescription are: (1) to preclude or minimize the occurrence of potentially adverse impacts from logging damage, (2) to improve timber sale economics when using helicopter yarding systems by retaining trees 16 inches diameter-at-breast-height (DBH) and less and retaining western hemlock trees greater than 36" DBH, (3) retain structural diversity and a biological legacy, and (4) retain scenic values in the recreational river corridor.

The desired future condition is a stand with three or more distinct size classes resulting in an uneven-aged stand. Natural regeneration is expected to be abundant.

Stands proposed for this system have approximately 50 percent of the basal area of the trees remaining after harvest. This regenerates and maintains a multi-aged structure by removing some trees in various

size classes distributed across the stand. Trees to be harvested are selected using a criterion such as species, diameter limits or spacing. A range of diameters, or everything above or below a certain diameter limit, may define the trees selected for harvest. Different diameters may be used for different species. The resulting stand may have small openings plus individual trees harvested throughout the stand. This maintains or creates a stand of three or more distinct size classes distributed throughout the stand, resulting in an uneven-aged stand.

Dispersing trees harvested throughout the stand would retain a continuous large tree canopy following harvest. The residual stand would have structural diversity that would provide wildlife habitat and maintain scenic quality. Damage to the residual trees and lower commercial stand productivity is an acceptable resource tradeoff to achieve these goals.

The next entry into these stands would be in approximately 75 years when 25 percent of the stand's basal area would be removed in patches or in single trees.

3.7.10 Intermediate Treatments for Managed Stands

Following timber harvest, the managed forest goes through distinctive developmental stages. Removal of the forest overstory alters the microsite conditions that influence density and species composition of the understory vegetation. Natural regeneration is used to restock the harvest units, which must be reforested with a minimum of 300 trees per acre by the fifth year following harvest. This is monitored with regeneration surveys and certification of successful reforestation. Different components dominate the stand at different stages, and the overall forest structure changes as the new stand develops. The level of change depends on the type of silvicultural treatment applied during harvest and subsequent treatments applied during stand development. Characteristics such as tree height, diameter, and overall stand productivity vary according to site class. However, second-growth stands commonly show less variability in tree diameter and height than the old-growth stands they are replacing. Second-growth timber has a stand size of seed-saplings or pole timber, which is usually the result of clearcut harvest. Currently, about 29 percent of the suitable forestland in the Kuiu Timber Sale Area is second-growth timber. Management of these harvested acres would improve stand conditions for future timber production and increase forage for deer and moose. Second-growth stands are candidates for thinning and pruning.

3.7.10.1 Thinning

Following timber harvest, natural regeneration often results in stands with too many trees per acre, reducing individual tree growth and shading out understory vegetation that may be valuable to some wildlife species. Thinning is designed to improve future tree growth by

reducing stand density, thus reducing the competition between trees for sunlight. Increased sunlight as a result of thinning also allows for greater shrub and forb growth, thereby increasing wildlife forage.

In older harvested stands (35 to 45 years or older), as the canopy progressively closes and sunlight is virtually absent beneath the canopy, the understory vegetation becomes suppressed. If thinned at this age, the thinning slash is extremely thick due to the size of the cut trees (some as large as 6 inches in diameter and 30 feet in height). The slash does not come into contact with the ground, and decomposes slowly. Consequently, sunlight is still limited due to the accumulation of thinning slash, and germination of forage species is limited for an extended period of time. The effectiveness of thinning is limited in older harvested stands, and at this point, it may be too late to improve forage.

Conversely, it is too early to thin when canopy cover is relatively sparse with many open spaces between trees. At this stage, there is usually abundant forage, and thinning does not generally provide much more forage. In addition, new hemlock regeneration can become established after thinning and suppress some release of the forage. When thinned too early, trees have not expressed dominance, making it difficult to select which trees to cut while thinning.

The first thinning program for harvested stands in the Kuiu Timber Sale Area began in 1982, when stands were approximately 10 to 15 years old. Stand thinning is currently prescribed at 25 – 30 years of age. Stands harvested prior to 1960 are considered too old to benefit from thinning. Since 1980, stands have been periodically surveyed to determine the need for thinning. Approximately 4,766 acres of the 10,393 acres in the Kuiu Timber Sale Area have been thinned to date.

The remaining 5,627 acres are not eligible for thinning or pruning because:

- 5,280 acres are too young for thinning to be effective, and
- 347 acres do not require thinning at this time due to site conditions resulting in spacing between trees such that competition between trees has not yet developed.

It is not known if thinning would have an application in uneven-aged stands resulting from partial harvest. Stocking surveys and additional analysis would be done as these stands develop.

3.7.10.2 Pruning

As a harvested stand develops to the point where the trees are too large to thin and the understory is stressed but able to be released, pruning may be considered. It may provide enough indirect sunlight

penetration through the canopy to maintain the understory vegetation for wildlife forage. Pruning also increases the value of each tree, by providing knot-free wood as the tree grows. Pruning allows the maximum volume to be produced in the stand while still maintaining the vegetative understory.

Thinning and pruning for wildlife is under consideration in some stands that were harvested in the late 1960s and have been thinned once. These stands are located along the 6402 road in the Saginaw Bay area.

3.7.11 Forest Health and Natural Disturbance

3.7.11.1 Wind Disturbance

Wind is the major disturbing influence shaping the south-aspect slopes within the Kuiu Timber Sale Area. Most of the south-aspect stands have evidence of periodic windthrow events where openings were created in which successive generations of trees, shrubs, and forbs were created.

If the south-aspect slopes are harvested, the edges of the residual stands will be more susceptible to wind damage, particularly when the units are clearcut in long, thin strips pointing in the southerly direction. The harvested groups will need to be oriented perpendicular to the direction of the dominant winds. High potential for windthrow exists in the helicopter units along Road 6413, as evidenced by the blowdown within the adjacent clearcut units. This windthrow occurred on east-facing slopes just upslope of the valley bottom adjacent to earlier clearcuts.

On the wind-exposed south-facing slopes, the most common progression of stand development starts with partial disturbance with most of the trees blowing down leaving varying numbers of legacy trees (residual trees following a blowdown event). Over time, seedlings emerge in the openings created by the wind event. The result is two distinct age classes in the stand: (1) individual trees that were left standing following the wind storm, and (2) the regenerated seedlings that started growing immediately following the storm. Other wind disturbances may occur during stand development. If all of the older trees blow over, the stand continues to develop with two age classes. If not, the stand structure becomes more complex, now containing three age classes. Many stands never develop more than three age classes, as the oldest age class continually blows over in major storm events.

The final stage of stand development, old-growth, usually occurs in wind-sheltered areas on the north-facing slopes of ridges and mountains. In these areas, where there is relatively infrequent disturbance, individual trees mature and die. These individual trees

create gaps in the canopy where seedlings will invade. This is called gap-phase dynamics, which results in stands with multiple age classes.

Field reconnaissance indicates that the east- or west-oriented medium elevation (1,000-1,500 feet) slopes in the project area seem to have a moderate risk of windthrow.

3.7.11.2 Yellow-cedar decline

Yellow-cedar decline is a disease causing considerable cedar mortality in Southeast Alaska. Mortality can be in small patches or can cover expansive areas. Affected trees may die more quickly (2 or 3 years), or more slowly over a 15-year period or longer with crowns progressively thinning. The cause of yellow-cedar decline is not completely understood but the disease generally occurs on wet, poorly-drained sites at lower and middle elevations. Recent studies theorize that mortality could be caused by soil toxicity or freeze damage to fine roots (Hennon and Shaw 1997).

The Kuiu Timber Sale Area has a low incidence of cedar decline in the proposed timber harvest units. Yellow-cedar may be salvaged from the stands.

3.7.11.3 Dwarf mistletoe

Dwarf mistletoe reduces the vigor and growth rate of hemlock and often produces a low quality of timber (Ruth and Harris 1979). Cankerous swellings often occur at the point of infection on limbs and main stems. These cankers offer an entrance for wood-destroying fungi, which can lead to heart rot. The occurrence of dwarf mistletoe is relatively light in the Kuiu Timber Sale Area.

Dwarf mistletoe progresses relatively slowly in Southeast Alaska. In stands that are partially harvested, the infected trees, if any, would be targeted for removal to eliminate the infected trees in the residual stand.

3.7.11.4 Decay Fungi

Wood decay fungi play an important role in the structure and function of coastal old-growth forests where fire and wind disturbance are uncommon. In addition to creating canopy gaps and wildlife habitat, decay fungi play an important role in nutrient cycling. The importance of wood decay fungi in young managed stands is less well understood.

There is evidence of decay fungi throughout the Kuiu Timber Sale Area. Approximately one third of the old-growth timber volume is defective in Southeast Alaska old-growth stands (USDA Forest Service 2003a). Although decay develops slowly, the longevity of individual trees allows ample time for significant amounts of decay to develop.

3.7.12 Direct and Indirect Effects

The structure of the forest would be affected by timber harvest. The effects would vary by the silvicultural prescription and the number of acres harvested. Partial harvest would maintain old-growth forest, but with fewer trees. The distribution of the trees would vary depending on the prescription. Removal of trees in patches would result in small openings that would regenerate to second-growth forest. Removal of trees dispersed throughout the stand would result in old trees interspersed with regeneration of young trees. Forest health concerns, including the removal of trees with disease, or that face imminent mortality; can be used as factors determining which trees to harvest. Clearcut harvest would result in the creation of primarily second-growth stands with or without older residual trees.

3.7.12.1 Alternative 1

Vegetation and forest health would not be affected by management activities. Tree growth and mortality would continue to progress naturally. Other forest lands with land use designations that allow timber harvest would need to meet the objective of providing timber for public consumption to meet market demand.

3.7.12.2 Alternative 2

In this alternative 197 acres would be converted to even-aged management. Forest health and commercial productivity would be improved by removing dwarf mistletoe-infected trees and trees infected by disease, and by creating younger, faster-growing forests.

Approximately 106 acres would be managed in an uneven-aged system by removing 50 percent of the basal area in clumps ¼-acre to one acre in size on 19 acres and by removing 50 percent of the basal area in individual trees dispersed throughout the stand on 87 acres. These stands would be harvested a second time in approximately 75 years. This second harvest would remove approximately 25 percent of the basal area. These stands would retain the structural diversity and biological legacy over the next 75 years allowing the previously harvested stands around them to develop better wildlife habitat (larger trees, more snow interception, and improved forage), before they are harvested.

An additional 188 acres would be harvested in a two-aged management system by harvesting 50 percent of the basal area in small clumps ¼-acre to one acre in size and individually where possible. These stands would not be re-entered for harvest until the end of the rotation (approximately 100 years). These stands would retain structural diversity and biological legacy of the forest (wider variation in tree sizes and spacing, decadent trees, multiple canopy layers), but the resulting forest would have lower net commercial volume. These

stands would retain canopy cover characteristics associated with old-growth forests throughout the rotation of the stand.

This alternative would impact the least number of acres and harvest the least volume of the action alternatives in the Kuiu Timber Sale Area.

3.7.12.3 Alternative 3

In this alternative 409 acres would be converted to even-aged management. Forest health and commercial productivity would be improved by removing dwarf mistletoe-infected trees and trees infected by disease; and by creating younger, faster-growing forests.

Approximately 91 acres would be managed in an uneven-aged system by removing 50 percent of the basal area in clumps ¼ to 1 acre in size on 19 acres and by removing 50 percent of the basal area in individual trees dispersed throughout the stand on 72 acres. These stands would receive a second harvest in approximately 75 years. This second harvest would remove approximately 25 percent of the basal area. These stands would retain the structural diversity and biological legacy associated with old-growth forests over the next 75 years allowing the previously harvested stands around them to develop better wildlife habitat (larger trees, more snow interception, and improved forage), before they are harvested.

An additional 294 acres would be harvested in a two-aged management system by harvesting 50 percent of the basal area in small clumps ¼-acre to one acre in size and individually where possible. These stands would not be entered for harvest again until the end of the rotation (approximately 100 years). These stands would retain structural diversity and biological legacy (wider variation in tree sizes and spacing, decadent trees, multiple canopy layers), but the resulting forest would have lower net commercial volume.

These stands would retain canopy cover characteristics associated with old-growth forests throughout the rotation of the stand.

This alternative would impact the second lowest number of acres in the action alternatives in the Kuiu Timber Sale Area and harvest the second lowest volume of the action alternatives.

3.7.12.4 Alternative 4

In this alternative 1,026 acres would be converted to even-aged management. Forest health and commercial productivity would be improved by removing dwarf mistletoe-infected trees and trees infected by disease; and by creating younger, faster-growing forests.

Approximately 257 acres would be managed in an uneven-aged system by removing 50 percent of the basal area in clumps ¼-acre to

one acre in size on 42 acres and by removing 50 percent of the basal area in individual trees dispersed throughout the stand on 215 acres. These stands would retain their structural diversity and biological legacy (wider variation in tree sizes and spacing, decadent trees, multiple canopy layers), but result in a forest with lower net commercial volume. These stands would receive a second harvest in approximately 75 years. This second harvest would remove approximately 25 percent of the basal area. These stands would retain canopy cover characteristics associated with old-growth forests over the next 75 years allowing the previously harvested stands around them to develop better wildlife habitat (larger trees, more snow interception, and improved forage), before they are harvested.

An additional 142 acres would be harvested in a two-aged management system by harvesting 50 percent of the basal area in small clumps ¼-acre to one acre in size and individually where possible. These stands would not be re-entered for harvest for the rotation of the stand (approximately 100 years). This alternative would provide the greatest volume and impact the greatest number of acres of the action alternatives.

3.7.12.5 Alternative 5

In this alternative 1,231 acres would be converted to an even-aged forest. Forest health and productivity would be improved by removing dwarf mistletoe infected trees and trees infected by disease, and by creating younger, faster-growing forests.

All the stands proposed for harvest in this alternative would mimic the results of a large, naturally-occurring wind event with the stands converted to even-aged stands. No structural diversity, biological legacy, or old-growth characteristics would remain in the stand other than the reserve trees retained to meet site-specific resource objectives. Natural regeneration is expected to contribute to the stand being fully stocked with seedlings within three years of the regeneration harvest.

This alternative would impact the second largest number of acres in the action alternatives in the Kuiu Timber Sale Area and is the most economical. It is the only alternative that proposes even-aged management by clearcutting for all proposed harvest units.

3.7.13 Cumulative Effects

Since 1954 there has been approximately 25,286 acres of timber harvested on Kuiu Island. There has been about 716 mmbf of timber harvested on Kuiu Island since 1964. The Tongass Five-Year Timber Sale Schedule shows an additional 49.7 million board feet of timber coming off Kuiu Island (in addition to Kuiu Timber Sale) in various locations. Since this is a timber production LUD, future harvest within the project area is projected by the Forest Plan on the acres that have been determined suitable for timber harvest. The timing, amount, and

location of future timber harvest would depend on several factors, including the amount of harvest, if any, resulting from this EIS and the demand for timber in Southeast Alaska.

Within the Kuiu Timber Sale Area, past harvesting has resulted in the conversion of 10,393 acres from old-growth forest to second-growth forest. Approximately 8,654 acres of these lands are on forested land within the suitable timber base (Table 3-67). The remaining 1,739 acres were harvested before Forest Plan land use designations were assigned and generally fall within what are now recognized as riparian reserves and beach fringe areas and are now designated by the Forest Plan as unsuitable for timber harvest. Thinning of second-growth or conversion to uneven-aged management may occur. All of the proposed harvest units that have an uneven-aged management prescription have subsequent entries planned. The current five-year timber sale schedule for VCUs 399, 400, 402, and 421 includes the Kuiu Timber Sale EIS scheduled for 2006 and 2007, which proposes harvesting 42.6 mmbf in the Kuiu Timber Sale Area.

Table 3 - 67. Cumulative acres of timber harvest by alternative

29,362 acres of suitable forest land	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Acres of harvest units proposed for this project	0	491	794	1,425	1,231
% of suitable forest acres proposed for this project	0	2	3	5	4
Acres of previous harvest on suitable forest	8,654 acres				
% Cumulative harvest of suitable forest	29	31	32	34	34

3.8 Fisheries

3.8.1 Introduction

Anadromous fish such as salmon spend part of their life in fresh water and part of their life in saltwater. Salmon spawn in fresh water, in features called redds. Females use their tails to dig holes in the gravel where they lay eggs, which are then fertilized by the males, and covered lightly with gravel. Newly hatched salmon live in the gravel, still attached to their yolk sacs. When the juvenile fish emerge from the gravel, the amount of time spent in fresh water varies. Pink and chum salmon migrate downstream soon after emergence, while coho and sockeye spend one to three years in fresh water.

Salmonids use a variety of different stream habitats throughout their life cycle in order to satisfy the unique demands of spawning and incubation, rearing, and overwintering (Sullivan et al. 1987). Limitations in habitat availability at any stage of development within a species' life cycle can potentially limit overall production. Forest harvest activities can potentially affect fish habitat by altering the amount and timing of runoff by altering sediment transport and deposition regimes (Sullivan et al. 1987), and by altering stream temperature (Beschta et al. 1987).

Removal of vegetation and the presence of roads can increase water yield and peak flows during salmon spawning seasons which may affect spawning success. The suitability of salmon spawning habitat is related to the capacity of stream flows to mobilize and scour bed substrates. Bed load movement can bury eggs to great depths, prohibiting fry emergence, or, alternatively, scour can remove or rework redds and crush incubating eggs or fry (Sullivan et al. 1987).

Management activities may affect salmon spawning success if an excess of fine sediments is introduced from management-caused landslides or poorly designed or maintained roads. Spawning requires the availability of clean gravels of appropriate size with intragravel flows sufficient to deliver dissolved oxygen to buried eggs (Sullivan et al. 1987).

Juvenile salmonids require cover from predators, areas of variable flow velocity for feeding, and areas of low flow velocity during winter storm events, including off-channel habitats and pools (Sullivan et al. 1987). Large wood input from adjacent riparian areas are important for providing cover, and the loss of wood can decrease overwinter survival of salmonids (Bisson et al. 1987). Large wood is also an important factor in pool formation, and pool spacing is dependent on wood loading in pool-riffle and plane-bed channels in Southeast Alaska (Montgomery et al. 1995). Timber harvest can potentially affect salmonid habitat if wood is removed from streams or if wood

recruitment is diminished through harvest in riparian areas. Riparian vegetation also shades streams and minimizes increases in water temperature due to solar radiation (Beschta et al. 1987).

3.8.1.1 Fine Sediment

Fine sediment can enter streams from log yarding and road construction activities. Fine sediments can reduce interstitial water flow, leading to depressed dissolved oxygen concentrations and physically trapping emerging fry in the gravel. Hicks et al. (1991b) found that in some cases in Alaska, salmonid survival was apparently affected over the short term when timber harvest activities increased the amount of fine sediment in spawning. However, the amount of sediment in gravels returned to pre-logging conditions within five years. The placement of buffers and implementation of BMPs and standards and guidelines would reduce the amount of fine sediment entering the streams.

3.8.1.2 Large Woody Debris

Forest management in western North America has affected the distribution and abundance of large woody debris (LWD) in streams in many cases. Changes include the reduction of large stable debris in streams of all sizes, concentration of debris in large but infrequent accumulations, and loss of important sources of new LWD for stream channels (Hicks et al. 1991b).

LWD plays an important role in controlling stream channel morphology, regulating the storage and routing of sediment and particulate organic matter, and creating and maintaining fish habitat (Hicks et al. 1991b).

Timber harvest adjacent to streams can alter the rate of contribution and loss of large woody debris. The placement of buffers along streams helps provide a continuous source of large woody debris (Hicks et al. 1991b).

3.8.1.3 Stream Temperature

Decreasing the amount of shade provided by streamside trees can increase the water temperature and decrease the amount of dissolved oxygen that the water can hold. The metabolic rates of fish and other aquatic organisms are directly related to the water temperature.

State water quality standards state that water temperatures may not exceed 20°C at any time. For fish streams, migration routes and rearing areas, temperatures may not exceed 15°C, and spawning and egg and fry incubation areas may not exceed 13°C (Alaska Department of Environmental Conservation 2003).

By leaving no-harvest buffers along Class I, II, and III streams, water temperatures are not expected to increase.

3.8.1.4 Stream Buffers

Stream buffers protect and regulate riparian areas. Riparian areas include water, land, and plants adjacent to perennial streams, lakes, and other bodies of water. Riparian plants maintain stream bank stability and floodplain integrity by inhibiting erosion. Plants provide shade that helps regulate stream temperature, large woody debris, and leaf and needle litter that fuels the aquatic food chain.

The Tongass Timber Reform Act (TTRA) of 1990 mandates that all Class I and Class II streams that flow directly into Class I streams receive a minimum 100-foot no harvest buffer. Prior to TTRA, riparian harvest did occur on Kuiu Island (Table 3-68).

Table 3 - 68. Acres of riparian harvest by watershed (WS)

Watershed Name	ADF&G number	Acres of riparian harvest within WS	Acres of riparian harvest within project area
Dean Creek	109-50-10070	105	105
Saginaw Creek	109-44-10390	450	450
None (Drains into Security Bay)	109-45-10090	85	85
Rowan	109-52-10060	363	79
Kadake	109-42-10300	410	100
None (Drains into Saginaw)	109-44-10370	13	13
Security Creek	109-45-10100	78	77

3.8.1.5 Stream Value Classes

Stream value classes are mapping units that indicate levels of habitat use by fish populations. Boundaries were delineated according to the following criteria, described in the Aquatic Habitat Management Handbook (FSH 2090.21).

Class I - Streams and lakes with anadromous or adfluvial fish or fish habitat, or high quality resident fish waters, or habitat above fish migration barriers known to be reasonable enhancement opportunities for anadromous fish.

Class II - Streams and lakes with resident fish or fish habitat and generally steep (6-25 percent or higher) gradient (can also include streams with a 0-6 percent gradient) where no anadromous fish occur, and otherwise do not meet Class I criteria.

Class III – Streams which are both perennial and intermittent streams that have no fish populations or fish habitat, but have sufficient flow or sediment and debris transport to directly influence downstream water quality or fish habitat capability. For streams less than 30 percent gradient, special care is needed to determine if resident fish are present.

Class IV - Other intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to have immediate influence on downstream water quality or fish habitat capability. Class IV streams do not have the characteristics of Class I, II, or III streams, and have a bankful width of at least 0.3 meters (one foot).

The Class IV designation was created under the 1997 Forest Plan and was identified and mapped for each unit and when possible outside the units.

Non-streams - Rills and other watercourses, generally intermittent and less than one-foot in bankfull width, little or no incision into the surrounding hillslope, and with little or no evidence of scour.

3.8.2 Resource Inventory

During the summer of 2003 and 2004, field surveys were conducted to verify fish presence or absence, fish species, channel type, and stream value class. This information was incorporated into a GIS based inventory (see Kuiu Fisheries Resource Report available in the Kuiu Timber Sale planning record)

3.8.3 Existing Condition

3.8.3.1 Watersheds

The north and east sides of Kuiu Island have had the most harvest. The project area is in northern Kuiu and encompasses eight watersheds. Table 3-43 shows the acres harvested within each of these watersheds. The watersheds contain important fish habitat that will be discussed in the following paragraphs. More detailed discussions on watersheds can be found in Issue 4 – Cumulative Watershed Effects, in this chapter and in Appendix C.

Kadake Creek Watershed

Kadake Creek Watershed (ADF&G # 109-42-10300) is the largest producer of steelhead and salmon on Kuiu Island and is used by sport fishermen more than any other stream on Kuiu Island. It has approximately 71 miles of Class I and 18 miles of Class II stream. It has a Recreational River LUD due to its high fish values for steelhead, coho salmon, and cutthroat trout. Few other streams receive as much angling pressure. Kadake Creek also has high wildlife, historic, scenic, and recreation values.

The number of steelhead redds and adult steelhead have been counted in Kadake Creek for 10 of the last 12 years. Although statistical analysis is incomplete, no obvious trends are evident.

Dean Creek Watershed

The Dean Creek Watershed (ADF&G # 109-50-10070) contains two lakes with a total of 6.6 acres and approximately 10 miles of Class I and four miles of Class II stream habitat.

The Dean Creek fish pass was built in 1984 to provide coho salmon passage over a 13-foot waterfall. Coho fry were transplanted from three adjacent drainages (Rowan Creek, Security Creek, and Saginaw Creek) over a seven year period (1983-1989). The fish pass was modified in 1994 for pink salmon. In addition to coho and pink salmon, Dean Creek also has chum salmon, steelhead, and Dolly Varden (Johnson et al. 2004).

Security Creek Watershed

The Security Creek Watershed (ADF&G # 109-45-10100) does not contain any lakes. There are approximately ten miles of Class I stream and five miles of Class II stream habitat. Security Creek has populations of coho, pink, chum, and Dolly Varden (Johnson et al. 2004).

Saginaw Creek Watershed

The Saginaw Creek Watershed (ADF&G # 109-44-10390) contains one small lake and approximately 14 miles of Class I and six miles of Class II stream habitat. Saginaw has coho, chum, pink, steelhead, Dolly Varden, and cutthroat trout (Johnson et al. 2004).

Rowan Creek Watershed

The Rowan Creek Watershed (ADF&G # 109-52-10060) has one large 19-acre lake and four smaller lakes which total one acre. There are 22 miles of Class I and 15 miles of Class II stream habitat. Rowan Creek has populations of coho, pink, sockeye, Dolly Varden, and cutthroat (Johnson et al. 2004).

Watershed #109-44-10370

This unnamed stream system drains into Saginaw Bay. It does not have any lakes but does have approximately three miles of Class I stream and six miles of Class II stream habitat. This stream has populations of coho, pink, and chum salmon as well as Dolly Varden, and steelhead (Johnson et al. 2004).

Watershed #109-45-10090

This unnamed stream system drains into Security Bay. It does not contain any lakes but it does have approximately one mile of Class I stream and three miles of Class II stream habitat. The fish species present are coho and pink salmon, and Dolly Varden (Johnson et al. 2004).

3.8.3.2 Roads and Stream Crossings

Guidelines for fish passage through culverts are specified in the Aquatic Habitat Management Handbook (FSH 2090.21). The guiding criteria for culvert design is to allow natural migration by adult and juvenile fish through the culvert during flows equal to or less than the discharge predicted to occur two days before or after the mean annual flood levels.

Each of the proposed action alternatives relies heavily on the existing road system with a supporting temporary road system to access timber. The miles of proposed temporary road construction varies between 2.9 and 19 miles depending on the action alternative (see Transportation section this chapter). Use of the existing road system minimizes interference with fish migration by avoiding installation of additional culverts, except for those associated with proposed temporary roads. For the action alternatives between 3.2 and 6.9 miles of existing closed classified roads would be needed to access timber, depending on the alternative. These roads would be reopened (reconstructed) including the installation of stream crossing structures (stringer bridges or culverts). Table 3-69 shows the existing and proposed stream crossings needing structures by stream class and alternative for the Kuiu Timber Sale Area.

Table 3 – 69. Existing and proposed stream crossings needing structures by stream class and alternative

Stream Class	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1	0	3	2	3	3
2	0	3	4	5	5
3	0	1	8	14	15
4	0	5	19	19	19

Road condition surveys assess the condition of existing roads, culverts, and drainage features. The Tongass National Forest maintains this information in a database, and updates are made as new information becomes available. As part of this road survey each of the fish crossings are analyzed to determine if juvenile fish can pass through the culvert at different flows. The fish crossings are categorized red, gray, or green. A red fish crossing is one that cannot pass juvenile fish at some or all flows, a green fish crossing is one that can pass juvenile fish at all flows up to the Q2 2-day flow (a two day delay from the mean annual flood), and a gray fish crossing needs additional analysis to determine if it is red or green. Within the project area, there are six grey culverts and 44 red culverts. Of the 44 red culverts, 11 are on Class I streams. One Class I stream and three Class II streams need upstream habitat analysis. Those culverts that have had upstream habitat analysis block or partially block approximately 2.4 miles of Class I habitat and 5.2 miles of Class II stream habitat. Currently an interagency group is working to develop a model that would help make management recommendations for the red culverts. The model is planned to be tested in 2006. Culverts are being prioritized by the degree of the barrier, species of fish, and amount of habitat upstream.

3.8.3.3 Marine Environment

The project area includes approximately 33.7 miles of shoreline which contains diverse estuarine and tidal ecosystems that include shrimp, flatfish, marine worms, starfish, sponges, anemones, sea cucumbers, urchins, shellfish, plankton, marine algae, and other organisms. The shallow marine waters are vital habitat for some commercially important species, such as Dungeness crab and juvenile salmon.

Log transfer facilities (LTFs) and log transport are the points of concentrated activity in the marine environment. The rest of the shoreline is protected by a 1,000-foot buffer (Forest Plan). There are two existing LTFs in north Kuiu that could be used for the action alternatives (see the Transportation section of this chapter for further details). Rowan Bay LTF and sort yard approximately six miles south of the project area and Saginaw Bay LTF and sort yard which is in the project area. All the action alternatives would use the existing administrative site at Rowan Bay or a floating camp to house the timber operators.

Rowan Bay

There are six anadromous fish streams that drain into Rowan Bay. Rowan Creek and Browns Creek are the largest producers. Rowan Creek has populations of coho and pink salmon, sockeye, Dolly Varden, and cutthroat. Browns Creek has populations of pink salmon, coho salmon, cutthroat trout, steelhead, Dolly Varden, and chum

salmon. Average annual pink salmon escapement from 1993 to 2002 was 29,000. Dungeness crab is harvested from Rowan Bay and the surrounding area.

In 1996 Rowan Bay was placed on the Section 303(d)[1] list for bark debris from the LTF. A dive on July 15, 2002 to monitor the bark deposit at Rowan Bay showed the LTF had an area with continuous bark coverage of 0.5 acres which is compliant with water quality standards, resulting in its removal from the Section 303(d) list in 2003.

Saginaw Bay

This LTF would require reconstruction, but the "footprint" of the LTF would not change. An existing storage yard located near the LTF on the uplands would be used if necessary. In addition to the storage area, a sort yard at the end of Road 6448 approximately one mile from the LTF site is proposed for log sorting prior to storage at the LTF site.

There are five cataloged anadromous fish streams entering Saginaw Bay with Saginaw Creek and Straight Creek being the largest producers. Saginaw Creek has coho, chum, and pink salmon, steelhead, Dolly Varden, and cutthroat trout. Straight Creek has populations of coho salmon, pink salmon, chum salmon, steelhead, Dolly Varden, and cutthroat trout (Johnson et al. 2004). Dungeness crabs are harvested in Saginaw Bay. The close proximity to the community of Kake makes Saginaw Bay an important fishing area.

In 1998 Saginaw Bay was placed on the Section 303(d) list for bark debris from the LTF. Two dives were completed in 2002. The dive on May 30, 2002 was based on previous dives' layouts. The continuous bark accumulation was 1.08 acres which is compliant with water quality standards, resulting in its removal from the Section 303(d) list in 2003.

3.8.4 Environmental Consequences

3.8.4.1 Direct and Indirect Effects

Effects Common to all Action Alternatives

Harvest units are designed so that all Class I and Class II streams that flow directly into Class I streams receive a minimum 100-foot buffer. Many stream channel types extend this buffer beyond the 100-foot

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[1] Section 303(d) is an EPA approved, State submitted, prioritized list of impaired waters as required by the Clean Water Act (33 USC 1313). Section 303(d) list provides a comprehensive inventory of water bodies impaired by all sources, including point sources, nonpoint sources, or a combination of both. This inventory is the basis for targeting water bodies for watershed-based solutions, and the TMDL process provides the analytical framework to develop these solutions.

minimum. Class III streams have a no harvest buffer within the v-notch or to the break in side slopes (see unit cards for site-specific buffers).

The action alternatives propose temporary road construction and reconstruction of some system roads. No construction of new classified roads is proposed (see the Transportation section in this chapter for road class definitions). All classified roads that are reopened for this timber sale would be put back into storage again after timber harvest is completed. Roads placed into storage would have all stream crossing structures removed and cross drains added where necessary. Roads in storage are system roads and may be reopened for future use.

The effects for all the action alternatives are expected to be short term. They include increased annual water yield and peak flows in small streams and a temporary increase in sediment delivery from temporary road construction, installation of culverts and bridges, and the removal of culverts on currently open roads (Table 3-70). Fish passage would be restored in the following two areas that do not meet current standards for fish passage and block or partially block approximately 636 feet of fish habitat:

- Storage of Road 6413 would remove a culvert that does not meet current fish passage standards.
- Excess fill left on site from a prior culvert removal on Road 6417 would be removed restoring fish passage.

Rowan and Saginaw Bay LTFs have recently been removed from the impaired waters list for bark accumulation. Although both LTFs are permitted for the rafting of logs under the EPA General Permit AK-G70-0027, the common practice in the timber industry is to barge logs. Bark accumulation would be monitored and if the accumulation exceeded EPA standards appropriate actions would be taken.

Table 3 - 70. Proposed fish stream structure removal

Alt	Road #	Class I Stream Structures Removed	Meets Current Fish Passage Standards	Class II Stream Structures Removed	Meets Current Fish Passage Standards
2	6413	1	Yes	1	Does not meet
	46096	1	Yes	0	
	6417	3	Yes	3	1 does not meet 2 meet
3	6413	1	Yes	1	Does not meet
	46096	1	Yes	0	
	6418	2	Yes	0	
	6417	3	Yes	3	1 does not meet 2 meet
4 and 5	6413	1	Yes	1	1 does not meet
	46096	1	Yes	0	
	6418	2	Yes	0	
	6417	3	Yes	3	1 does not meet

3.8.5 Comparison of Effects by Alternative

3.8.5.1 Alternative 1 (No Action Alternative)

In this alternative, there would be no timber harvest, no roads would be built, and no additional roads would be put into storage. No changes in water yield, sediment delivery to streams, or fish passage are expected to occur except for naturally occurring events. This does not preclude regular maintenance of roads and the removal or replacement of culverts that do not allow fish passage.

3.8.5.2 Alternative 2

This alternative proposes the harvest of 14.6 mmbf of timber from 491 acres. Timber harvest in this alternative would require the construction of 2.9 miles of temporary road. There are 4.5 miles of roads currently in storage that would have to be reopened, which would require replacing the culverts or bridges on three Class I streams and three Class II streams (Table 3-69). The replacement of the Class I structures would require timing restrictions to minimize impacts to fish (see the road cards in Appendix B). This alternative would close an additional 8.2 miles of road after timber harvest is complete. The

harvest would occur in six watersheds; Security Creek, Saginaw Creek, Rowan Creek, Kadake Creek, Watershed 109-44-10390, and Watershed 109-52-10070.

3.8.5.3 Alternative 3

This alternative proposes the harvest of 23.6 mmbf of timber and the construction of 7.5 miles of temporary road. Temporary road construction would require one new Class II stream crossing (Table 3-69). There are 3.2 miles of road that are currently in storage that would have to be reopened, which would require replacing two Class I and three Class II culverts or bridge crossings on Road 6417 (Table 3-69). All structures on the temporary roads and reconstructed classified roads would be removed after logging is complete. An additional 8.4 miles of currently open road would be put into storage at the end of this project. The harvest would occur in five watersheds; Security Creek, Saginaw Creek, Rowan Creek, Kadake Creek, and Watershed # 109-44-10370.

3.8.5.4 Alternative 4

This alternative proposes the harvest of 42.6 mmbf of timber and construction of 19 miles of temporary road. There are 6.1 miles of road that are currently in storage that would have to be reopened. Temporary road construction would require two new Class II stream crossings, and road reconstruction would require replacing three Class I and three Class II stream crossings on Road 6417 (Table 3-69). After timber harvest is completed, an additional 11 miles of currently open road would be put into storage with all structures pulled. The harvest would occur in six watersheds; Security Creek, Saginaw Creek, Rowan Creek, Kadake Creek, Watershed 109-44-10390, and Watershed 109-52-10070.

3.8.5.5 Alternative 5

This alternative proposes the harvest of 36.3 mmbf of timber and the construction of 17.1 miles of temporary road. There are 6.9 miles of road that are currently in storage that would have to be reopened. Temporary road construction would require two new Class II stream crossings, and road reconstruction would require replacing three Class I and three Class II stream crossings on Road 6417 (Table 3-69). After timber harvest is completed, an additional 11 miles of currently open road would be put into storage with all structures pulled. The harvest would occur in six Watersheds; Security Creek, Saginaw Creek, Rowan Creek, Kadake Creek, Watershed 109-44-10390, and Watershed 109-52-10070.

3.8.6 Cumulative Effects

Cumulative effects to fish include all past, present, and reasonable foreseeable future management activities. Past activities include the Dean Creek fish pass, which opened approximately 6.5 miles of stream for coho, pink, and chum salmon, steelhead and Dolly Varden. Past activities also include road construction and timber harvest.

Cumulative effects for this project include the potential harvest of units from the Crane and Rowan Mountain EIS and road maintenance. Within the project area, the harvest units from the Crane and Rowan FEIS lie in the Security Creek, Dean Creek, and an unnamed unnumbered Watershed in the north portion of the project area. According to the five-year timber sale schedule, there is no additional harvest scheduled in the project area, but the Bayport EIS borders the project area to the south and may affect the Kadake and Rowan Creek Watersheds.

3.8.7 Essential Fish Habitat Assessment

The Magnuson-Stevens Fishery Conservation and Management Act (the Act) defines Essential Fish Habitat (EFH) as "those waters and substrates necessary for fish spawning, breeding, feeding, or growth to maturity." For EFH, "fish" refers to federally managed fish or shellfish species and their prey. Marine EFH in Alaska includes estuarine and marine areas from tidally submerged habitat to the 200-mile exclusive economic zone (EEZ). Freshwater EFH includes streams, rivers, lakes, ponds, wetlands and other bodies of water currently and historically accessible to salmon. EFH for Pacific salmon recognizes six critical life history stages:

- Spawning and incubation of eggs
- Juvenile rearing
- Winter and summer rearing during freshwater residency
- Juvenile migration between freshwater and estuarine rearing habitats
- Marine residency of immature and maturing adults
- Adult spawning migration

Habitat requirements within these periods can differ significantly and any modification of the habitat within these periods can adversely affect EFH.

Section 305(b)(2) of the Act states that all federal agencies must consult the National Marine Fisheries Service (NMFS) for actions or proposed actions that may adversely affect EFH. The Act promotes the protection of these habitats through review, assessment, and mitigation of activities that may adversely affect these habitats. On August 25, 2000 the Forest Service, Alaska Region, and NMFS agreed to a procedure for the consultation. This Environmental Impact Statement

(EIS) satisfies the consultation requirements by providing 1) a description of the proposed action, 2) an analysis of individual and cumulative effects of the action on EFH, the managed species, and associated species such as major prey species, including affected life history stages, 3) the Forest Service's views regarding effects on EFH, and 4) a discussion of proposed mitigation, if applicable. The formal consultation will start when NMFS receives a copy of the draft environmental impact statement (DEIS) with the EFH Assessment. NMFS may then respond in writing as to whether it concurs with the findings of the assessment, or make conservation recommendations. The Forest Service must respond to conservation recommendations within 30 days. Documentation of the consultation process will be included in the FEIS.

A description of the Kuiu Timber Sale Area is located in Chapter 1. Either the Rowan Bay or the Saginaw Bay LTF may be used. If the LTF at Saginaw Bay is used it would need to be rebuilt and the old campsite near the LTF would be used as a sort yard. While the LTF is in operation, it must be dived annually to monitor bark accumulation. The last dive to monitor the bark deposit at Rowan Bay took place on July 15, 2002. The LTF had an area with continuous bark cover of 0.5 acres. The substrate near the LTF is mainly silt with some areas of sand, gravel, shells, and bedrock. The Saginaw Bay LTF was last dived on May 30, 2002 and the continuous bark accumulation was 1.08 acres. Sporadic use of either LTF is not expected to cause additional bark accumulation.

According to the queriable database (http://www.fakr.noaa.gov), NMFS has identified Rowan Bay as EFH for adult and late juvenile arrowtooth flounder, yelloweye rockfish, dusky rockfish, Pacific ocean perch, walleye pollock, sculpin, skates, Pacific cod, flathead sole, rex sole, shortraker and rougheye rockfish. The Saginaw Bay is EFH for Pacific cod, arrowtooth flounder, Pacific Ocean perch, walleye pollock, dusky rockfish, shortraker and rougheye rockfish, yelloweye rockfish, sablefish, sculpin and skates. Primary prey items for the managed species follow as described in the Gulf of Alaska Fishery Management Plan (FMP), March 1, 2002.

- Arrowtooth flounder feed in gravel-mud substrates near the seafloor. Adults feed on other fish. Juveniles feed on crustaceans, and young pollock.
- Yelloweye rockfish eat primarily fish, but also feed on shrimp, small crabs, and lingcod eggs.
- Dusky rockfish have a diet mainly of plankton, squid, octopus, shrimp, and hermit crabs are also consumed.

- Pacific Ocean perch feed on plankton. Adults may eat small shrimp and squids.
- Walleye pollock feed throughout the water column on small crustacean, young pollock, and other fish.
- Sculpins feed mainly near the bottom. Prey items include crabs, barnacles, and mussels. Larger sculpins eat fish.
- Skates feed on bottom invertebrates (crustaceans, mollusks, and polychaetes) and fish.
- Pacific cod feed mostly on other fish. Young cod feed mostly on invertebrates.
- Flathead sole prey on brittle stars, basket stars, tanner crabs, smelts, bivalves, and worms.
- Rex sole feed on worms and snow crabs.
- Shortraker and rougheye rockfish feed on shrimp, squids, and fish.

The potential effects of the LTF on marine EFH include diminished habitat for managed species and their prey due to placement of shot rock fill and bark accumulation. Another effect is reduced rearing capability for juvenile salmon due to potential reduced water quality from bark lechates and shading beneath log rafts and equipment floats. Potential effects on freshwater EFH include increased peak flows, increased sediment delivery, altered riparian vegetation and disturbed channel integrity, which may reduce habitat quality for salmon.

The Forest Service's position is that harvesting timber near Class I streams and wetlands, and the use of the Rowan Bay or Saginaw Bay LTFs may have an adverse affect on Essential Fish Habitat. However, by following the standards and guidelines in the Forest Plan and implementing the Best Management Practices (BMPs), the effects on EFH would be minimized because:

- All Class I and Class II streams[1] within the project area would be protected by a no-harvest buffer of 100 feet or more[2] (see unit cards in Appendix B for site-specific activities).
- All Class III streams would be protected by no-harvest buffers according to the Forest Plan. This minimizes the potential impact to downstream Essential Fish Habitat (see unit cards in Appendix B for site-specific activities).

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[1] See Appendix B for stream class definitions

[2] The mitigation measures for no harvest buffers are located in the Aquatic Habitat Management Handbook FSH 2090.21_30 page 5.

- In areas where wind damage has occurred in the past, buffer widths would be increased, and additional trees would be left standing to assure resistance to wi[illegible]hrow (see unit cards in Appendix B for locations of increased buffer widths).
- BMPs would be implemented to protect water quality and aquatic habitat for all freshwater streams within the project area (see unit cards in Appendix B for site-specific activities).
- Only temporary road construction would occur.
- The Saginaw and Rowan Bay LTFs would comply with the Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES) permit requirements.

3.8.7.1 Conclusions

The Forest Service believes that these mitigation measures would avoid or minimize the effects of this timber sale on Essential Fish Habitat. Impacts to EFH are likely to occur only from unforeseen events. A copy of the DEIS will be given to NMFS as stated in the agreement, and the Forest Service will continue the consultation process with the National Marine Fisheries Service.

3.9 Soils and Geology

3.9.1 Geology and Minerals

North Kuiu is formed from the Alexander Terrane[1]. The landscape has been altered through time by repeated glaciation. The Kuiu Timber Sale Area is within the Rowan Sediments and North Prince of Wales-Kuiu Carbonates Ecological Subsections (Nowacki et al. 2001). The terrane includes interbedded ocean trench sediments, shallow water limestone, sedimentary rocks (primarily mudstone, graywacke, and turbidites), volcanic rocks, and chert. (*Kuiu island Landscape Assessment* 2005). Calcareous mudstones from the Bay of Pillars formation are also present (*Kuiu Island Landscape Assessment* 2005). There are no known mineral occurrences of commercial value within the Kuiu Timber Sale Area. The April 2004 Alaskan Bureau of Land Management Mining Report lists no mining claims or patented mining claim groups within the project area. The proposed action would have no direct or indirect impact on mineral resources.

3.9.2 Karst

Karst is a comprehensive term that applies to the unique topography, surface and subsurface drainage systems, and landforms that develop by the action of water on soluble rock. In the Kuiu Timber Sale Area that rock is limestone and marble, and in some cases calcareous mudstones. The dissolution of the rock results in the development of internal drainage producing sinking streams, closed depressions, and other solution landforms such as sinkholes, collapsed channels and caves. It has been found that, to one extent or another, karsts develop within all carbonate blocks. In Southeast Alaska the purity of carbonates, proximal peatlands, and highly fractured bedrock are particularly favorable for karst development (Baichtal and Swanston 1996).

The Tongass National Forest has developed management guidelines which strive to protect and maintain the function and biological significance of karst landscapes and caves found, per the requirements of the Federal Cave Resources Protection Act of 1988. Within the Kuiu Timber Sale Area, 6,624 acres of carbonate bedrock including 2,270 acres of karst, have been identified along the northeastern boundary. All proposed alternatives have been modified so that no timber harvest, road construction, or quarry development would occur in these areas or along the drainages which flow to them.

3.9.3 Soils

Soils provide the foundation for the forest ecosystem and have evolved with time, climate, and vegetation. Soil development in the Kuiu Timber Sale Area has been strongly influenced by high precipitation and cool soil temperatures. Under such conditions, organic matter

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[1] The Alexander Terrane is made up of a block of interbedded marine volcanic and sedimentary rocks that began forming more than 200 million years ago.

decomposes slowly and accumulates on-site. A thick organic surface horizon composed of forest litter is common on mineral soils. Deep organic soils develop where movement of water is impeded by bedrock or other restrictive horizons. Tree rooting is generally very shallow, even in deep soils, with most of the roots present in the surface organic layers and the upper few inches of mineral soil. Typically the rooting zone is almost always wet, very acidic, and it contains many of the nutrients required for plant growth.

Scoping comments for the Kuiu Timber Sale Area did not identify any specific soil related issues. The Forest Plan however has identified two concerns pertinent to proposed timber harvests that are applicable. The concerns are: 1) soil productivity loss due to roads, rockpits, and detrimental soil conditions created as a result of timber harvests, and 2) erosion due to management-induced mass wasting (i.e. various types of landslides: avalanches, debris and earth flows, soil creep, slumps, etc.).

3.9.3.1 Mineral Soils

Mineral soils, accounting for over 72 percent of soil in the project area, originate from weathered bedrock, glacial till, alluvium (water worked sediments), and colluvium (sediments moved by gravity from upslope areas), and are typically overlain with a thick organic layer. Soil depth beneath a 6 to 10 inch layer of organic matter ranges from 10 inches to more than 20 feet.

Drainage in mineral soils ranges from poorly drained to extremely well-drained. Drainage is a critical factor in tree growth and site productivity. Good drainage generally encourages more productive forestland while poor drainage usually results in poor forest productivity.

Well-drained, deep soils derived from carbonate rocks, make up about six percent of the project area. The soils derived from carbonate rocks are limited to the limestone geology near Saginaw Bay. The calcareous mudstone and thin beds of limestone add valuable nutrients to the soil. The higher pH created by the weathering rocks neutralizes some of the acidity common to Southeast Alaska soils, making nutrients more available to plants.

3.9.3.2 Organic Soils

Organic soils (classified as Histosols), accounting for approximately 14 percent of the Kuiu Timber Sale Area are derived from highly decomposed plant material, typically found on low slope areas (0-35 percent), and are very poorly drained. Sphagnum peat and sedge muskegs are common types of organic soils. Histosols develop in water-saturated environments and contain between 12 and 18 percent organic carbon. Almost all Histosols are considered wetlands.

3.9.4 Soil Productivity

The Forest Service Manual (FSM 2554.05-13) defines soil productivity as the inherent capacity of a soil to support the growth of specific plant communities. Deep well-drained soils are the most productive for tree growth, even though tree rooting is shallow. Thick matting resulting from accumulating and decaying organic matter helps to minimize soil erosion. Maintaining soil drainage while minimizing soil erosion are both key to soil productivity in the Kuiu Timber Sale Area.

3.9.5 Soil Disturbance and Erosion

Soil disturbance is part of a natural and ongoing process within a forest ecosystem. Erosion is considered one phase of soil disturbance, initiated by natural processes such as heavy or consistent precipitation, landslides, windthrow, and fire. Soil disturbance can also be initiated by land management activities (e.g. road construction, timber harvest, and rock pit development (Swanston 1995)), and unmanaged activities (e.g. excessive off-highway vehicle use (OHV)). The level of disturbance varies with management practices and site characteristics.

Forest Plan standards and guidelines state that no more than 15 percent of an activity area can be detrimentally disturbed through management practices (FSM 2554.03-10). Documented detrimental soil conditions includes soil displacement, eroded areas, compaction and puddling, mass movements, and ground cover removal. Roads are the largest contributor of management induced soil disturbance on the Tongass National Forest (*Kuiu Island Landscape Assessment* 2005). Classified roads are considered a dedicated use of the soil resource and normally are not included when calculating detrimental soil conditions, whereas temporary roads are included. For purposes of analyzing cumulative effects to the soil resource for this report, all roads in the Kuiu Timber Sale Area are included.

3.9.5.1 Mass Movement

Analysis in Southeast Alaska between 1963 and 1983 revealed that landslides over 100 cubic yards in size were 3.5 times more likely to occur in harvested areas than in unharvested areas (Swanston and Marion 1991). However, Swanston noted that "as a general rule, landslides in harvest areas are significantly smaller, occur at lower elevations, develop on gentler gradients, and tend to travel shorter distances [than naturally induced landslides]" (Swanston and Marion 1991). The areas considered hazardous or most prone to landslides are those with steep slopes or areas with distinct slip-planes (such as those with compacted glacial till or bedrock sloping parallel to the surface) and those with a northwest-southeast aspect (warmer areas). During heavy rainfall or snowfall events (during snow melt) these areas have a higher likelihood of failing especially if previously disturbed by blasting for rock pits, road pioneering, side casting of excavated material, or logging practices (Swanston and Marion 1991).

In another Southeast Alaska landslide analysis conducted for the Forest Service (Landwehr 2000, unpub.), Landwehr compares the results of his study from 1971 to 1991 against that of Swanston and Marion (1991) (Table 3-71), noting that in the Landwehr study all landslides visible on aerial photos were included, regardless of their size.

Table 3-71. Landslide analysis of Swanston and Marion (1991) and Landwehr (2000, unpub.).

20 Year Analysis	Landslides			
	Per acre of unharvested areas	Per acre of harvested areas	Ratio between harvested and unharvested	Per mile of road construction
Swanston and Marion (1991)	1 slide/8,021 acres	1 slide/2,348 acres	3.42 higher in harvested	N/A
Landwehr (2000, unpub.).	1 slide/3,324 acres	1 slide/418 acres	7.95 higher in harvested	1 slide/31 mile

Mass movement ratings have been developed to assist management at the planning level for predicting the landslide potential of an area. The formula or calculation used to determine a rating or mass movement index (MMI) can differ between users. When determining the MMI rating for units within the Kuiu Timber Sale Area, four categories were used to rank soil units, as suggested by Swanston (1995). The relative ranking provided in the Geographic Information Systems (GIS) database used by the Forest Service used to classify a MMI rating is based on several factors which include: soil data identified in the Soil Resource Inventory (SRI) established for the northern and central portions of the Tongass, state-of-the-art research, soil properties (including slope gradient), and collective experience within Forest Service management. The rating is based on how soils will react at soil saturation without major stabilizing events and is intended to reflect the natural stability (or instability) of a slope under natural conditions (Swanston 1995).

Kuiu Timber Sale

Figure 3-9

MMI-3 and MMI-4 Soils within the Kuiu Timber Sale Area

Legend

- MMI-4 Extreme
- MMI-3 High
- Productive Old-Growth
- Managed Stands
- Lakes/Saltwater
- Unit Pool
- Project Area Boundary
- 500ft Contour Interval
- Stream Value Class I & II
- Existing Open Roads
- Roads in Storage (Closed)
- Decommissioned Roads

Saginaw Bay

Keku Strait

Security Bay

Kadake Bay

N

0 0.5 1 2 3 4 Miles

K:\kuiu_coast\gis\pdfs\kstmmap13_10soils.mxd 7.21.05 EP

Slope gradient is a primary site factor for determining the stability of natural slopes. For reference purposes, the MMI ratings identified by Swanston (1995) are generally associated with the following slope gradients:

- MMI – 1 (low): 5 to 35 percent
- MMI – 2 (moderate): 35 to 51 percent
- MMI – 3 (high): 51 to 72 percent
- MMI – 4 (extreme): over 72 percent

Other factors that contribute to slope stability and calculating a MMI rating include drainage density and dissection, soil depth and drainage patterns, and slope length and shape (Swanston 1995).

Vegetative growth on slopes also effects soil strength. Four to seven years after harvests, root strength tends to decrease because of decomposition (Ziemer and Swanston 1977) and soil cohesion begins to lessen. This information is validated through a study by Johnson et al. (2000) for landslides that occurred on Prince of Wales. Prince of Wales is part of the Alexander terrane, having similar rocks and soils as in the Kuiu Timber Sale Area. Johnson et al (2002) found that in landslides initiated by a single storm event in 1993, 89 percent of over 300 landslides that occurred were in areas with rotted roots and convergent topography.

Soils having slope gradients greater than 50 percent may need special road construction design (i.e. benching and end-hauling overburden away from cutbank (Krosse 1993)). At the Forest Planning level, areas with slope gradients of 72 percent or more are removed from the tentatively suitable timber base due to a higher risk of landslides. However, the Forest Supervisor or District Ranger at the project level may approve timber harvest on these slopes, on a case-by-case basis. Their decision includes consideration of results from an on-site analysis of slope stability, stability documented on a Soil Stability Investigation Report, an assessment of impacts of potential accelerated erosion on down slope areas, downstream fish habitats, as well as other affected resources and economical factors.

3.9.6 Existing Condition

3.9.6.1 Effects of Past Actions

Approximately 22 percent of the Kuiu Timber Sale Area has been harvested in the past 30 years, mostly from valley bottoms and gentle slope areas (Table 3-72). The Kuiu Timber Sale proposal includes harvest on some steeper and mid-slope areas considered through the MMI Rating process as hazardous areas (MMI-3 and MMI-4) (Figure 3-9).

Table 3-72. Acres previously harvested in the Kuiu Timber Sale Area by MMI Class.

MMI Class	Project area Acres	Acres Harvested	% Hazard class harvested
1 – Low	19,284	5,273	27%
2 – Moderate	20,862	4,668	22%
3 – High	2,595	190	7%
4 – Extreme	3,361	262	8%
Totals	46,102	10,393	22%

3.9.6.2 Mass Movement

Mass wasting and general slope failures have occurred within the Kuiu Timber Sale Area (Figure 3-8). Evidence of road failures can be seen in tension cracks, blown culverts and filled ditches. A landslide inventory was completed in December 2003 using aerial photos taken in 1998 and Forest Service land surveys completed in the 1960s and 1980s. Through the inventory, 57 known landslides were identified within the Kuiu Timber Sale Area varying in size from 0.5 acre to 88 acres (Table 3-73). One of these was a large rotational failure that occurred after a rain on snow event in December 1988. This slide today is partially revegetated and recovering. No units are proposed on or near this slide. The landslides analyzed originated on moderate to steep slopes, or in areas where shallow soils come into contact with glacial till or bedrock.

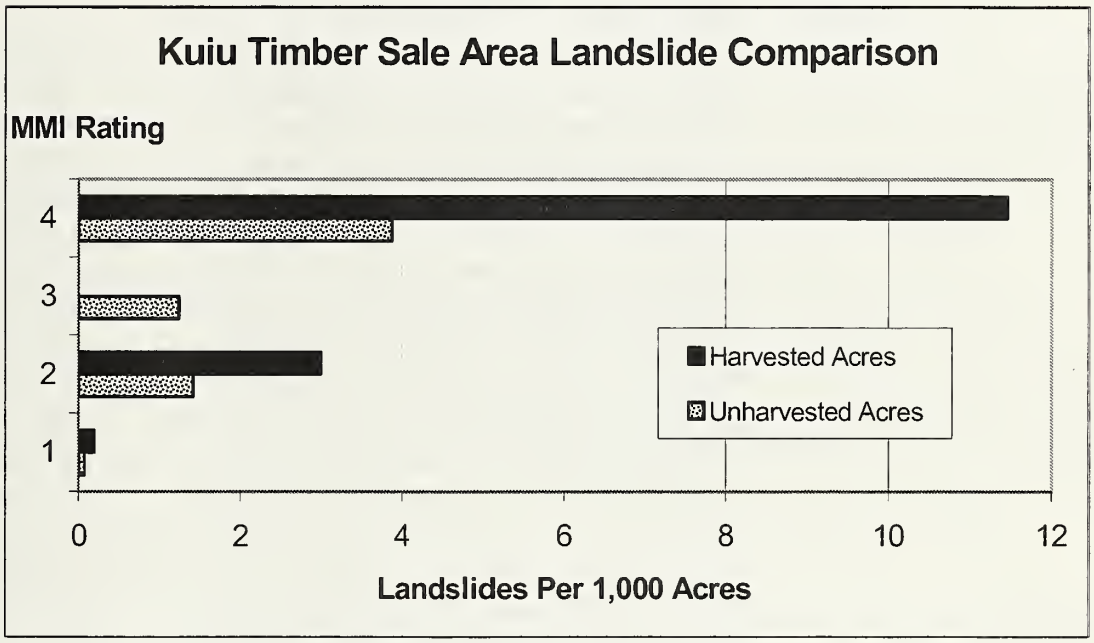
Landslides for MMI-1 and MMI-2 areas were two times higher in harvested areas than in unharvested areas (Chart 3-6). For MMI-4 areas, there were almost three times as many landslides in harvested areas compared to unharvested areas. This inventory analysis supports previously referenced research stating that more landslides occur in harvested areas (Swanston and Marion 1991).

Table 3 - 73 Inventory of landslides within the Kuiu Timber Sale Area

	Unharvested acres		Harvested acres	
MMI Rating	**Landslides**	**# of slides/1000 acres[a]**	**Landslides**	**# of slides/1000 acres[b]**
1 – Low	1	0.07	1	0.19
2 – Moderate	23	1.42	14	2.99
3 – High	3	1.25	0	N/A
4 - Extreme	12	3.87	3	11.45

[a] Ratio was developed from unharvested acres within the Kuiu Timber Sale Area Table 3-72.
[b] Ratio was calculated from harvested acres within the Kuiu Timber Sale Area Table 3-72.

Chart 3 -6. Kuiu Timber Sale Area landslide comparison



3.9.7 Environmental Consequences

3.9.7.1 Methodology

Data used for soil analysis comes from existing resources such as the Soil Resource Inventory (SRI), the landslide inventory and field data collected through on-site surveys conducted throughout the summer of 2004. Road acres are based on an average road width of 40 feet (from top of cutslope to toe of fillslope) or 4.85 acres per mile.

Effects are estimated based on the following measures:

- Estimated acres of detrimental soil conditions in harvest units based on yarding method
- Acres of timber harvest on slopes over 72 percent, acres of timber harvest by MMI Class and estimated numbers of landslides
- Cumulative acres of soil removed from productivity by roads, detrimental soil conditions within harvest units and estimated numbers of landslides

3.9.7.2 Timber Harvest

Detrimental soil conditions are often created within harvest units as a result of yarding activities. Literature pertaining to actual acres of soil impacted through detrimental disturbance is limited for soils within Southeast Alaska. However, a survey was performed by Landwehr and Nowacki (1999, unpub.) where detrimental soil conditions were monitored as a result of a clearcut timber harvest on northern Prince of Wales Island. They found that partial suspension and shovel yarding within the clearcut harvest areas resulted in five percent disturbance of the acres harvested, and three percent disturbance as a result of helicopter yarding. Table 3-74 shows the amounts of detrimental soil condition by alternative and proposed activity. The percent of detrimental soil disturbance is calculated for the actual acres of disturbance, not for the entire project area (i.e. five percent disturbance for Alternative 4 on 1,255 acres of ground based yarding would equal 63 acres; three percent disturbance on 170 acres of helicopter yarding would equal 5 acres. When these numbers are combined with the 92 acres of temporary road construction (using an average clearing width of 40 feet) the total acres of detrimental soil conditions would equal 160 for this alternative. Note that the calculations for detrimental soil disturbance due to yarding methods were based on clearcut harvest and therefore could be overestimated for Alternatives 2, 3, and 4.

Table 3 - 74. Acres detrimental soil disturbance from harvest and road construction by alternative

Soil disturbance	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Ground yarding	0	25	40	63	62
Helicopter yarding	0	0	0	5	0
Temporary road construction	0	14	35	92	83
Total acres soil disturbance	0	39	75	160	145

Although soils and landforms are not identical between Prince of Wales and Kuiu Island, there are similarities such as rock types (volcanics, limestone, marine and sedimentary deposits), soil orders (Spodosols and Histosols), vegetation (spruce and hemlock trees). Additionally, both areas are considered to have a cool and moist environment. Because of these similarities, the estimates by Landwehr and Nowacki (1999, unpub.) stated above are used when evaluating detrimental soil conditions by alternative within the Kuiu Timber Sale Area.

Alternative 4 has the greatest potential for landslides of all the alternatives due to the greater number of acres proposed for harvest (1,425 acres), the highest amount of harvest on MMI-4 soils (52 acres), and the second most amount of clearcut harvest proposed over the other alternatives (1,026 acres). Alternative 4 is estimated to produce 160 acres, or 11 percent detrimental disturbance as a result of the proposed harvest. As stated earlier, this calculation may be overestimated because Alternative 4 includes partial harvest units.

Table 3-75 shows the acres of proposed timber harvest by alternative within each MMI Class. Depending on alternative, one to four percent of harvest acres are proposed on units with a MMI-3 or MMI-4 rating. For these areas on-site evaluations resulted in specific silvicultural prescriptions such as partial suspension of the logs, partial to full retention of trees within the MMI area, or recommending that helicopter yarding be used; all of which are documented on the appropriate unit cards (Appendix B).

Landslide potential is projected to be higher (two times over unharvested areas) for all alternatives on MMI-2 soils, and three times as likely on MMI-4 soils.

Table 3 - 75. Acres* MMI in proposed units by alternative

MMI Class	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
1 - Low	0	146	115	374	299
2 – Moderate	0	329	669	999	914
3 – High	0	2	2	0	2
4 – Extreme	0	14	8	52	16
Total Acres	0	491	794	1,425	1,231

*variations in acres are the result of rounding.

There is a lower likelihood of slides per acre in MMI-2 areas over MMI-4 areas (Chart 3-6), however these lower elevation, gentler sloped MMI-2 areas occur more often on the landscape and therefore have a higher overall number of landslides than MMI-4 areas. As a general rule, the landslides on the gentler gradients (MMI-1 and MMI-2) tend to travel shorter distances and are smaller in size (Swanston and Marion 1991). The action alternatives propose more harvest in MMI-2 soils than all other MMI classes combined. It is therefore projected that there is a potential for more, smaller, landslides within harvested units with MMI-2 soils. Table 3-76 displays the potential increase of landslides by alternative.

Landslides occur naturally on the landscape (Table 3-73 and Chart 3 - 6) and as discussed above, harvest increases the rate of landslides on that landscape. Table 3-76 is a tool used to compare the estimated potential rate of increase for landslides within the project area between alternatives. It does not predict the number of landslides that would occur nor does it estimate the size, distance of travel, or type of landslide (soil creep, slump, debris flow, etc.). The rate of potential increase was calculated from the inventory of landslides within the project area (Table 3-73) and applied to the proposed acres of harvest within each alternative. The Soils and Geology Specialist Analysis Report in the project planning record contains a more in depth discussion on this method.

Table 3 - 76. Estimated potential rate of landslides by alternative for proposed acres of harvest within MMI Class

MMI Class	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1 -Low	0	0.018	0.014	0.045	0.036
2-Moderate	0	0.52	1.056	1.574	1.44
3-High	0	0.003	0.003	0.000	0.003
4- Extreme	0	0.106	0.061	0.409	0.136
Potential Rate of Increase	0	0.647	1.134	2.028	1.615

This table displays the difference between the projected landslide rate with the proposed harvest by alternative and the projected landslide rate within the same areas with no harvest. The difference equals the projected increase of landslides by MMI Class due to harvest.

3.9.7.3 Roads

Small changes to drainage surfaces created by roads can result in large changes for surface erosion and sedimentation accumulation (USDA FS 1999). Roads placed in areas with steeper slopes are more prone to failure through mass wasting from activities such as roadcuts, fillslopes, or rerouting hillslope drainage. The failure track can extend long distances from a failed site. In addition, many roads considered stable under normal climatic conditions are subject to fail in areas with high amounts of precipitation such as Kuiu Island (USDA FS 1999). Precipitation within Southeast Alaska is generally reported to be between 60 and 200 cm annually (USDA FS 2005). Specific climate data for the Kuiu Timber Sale Area was not available; however Kake (10 miles northeast of Kuiu) receives 152 cm of rainfall annually and Petersburg (70 miles east of Kuiu) receives 267 cm annually (Mead 2002), both of which are considered "high precipitation" for the purpose of this analysis.

Temporary road construction is needed to access timber in all action alternatives. Road construction removes approximately 4.85 acres per mile of road from soil productivity (based on 40 foot wide road right-of-way).

Table 3-77 displays the miles of proposed road construction by alternative. As directed by the Forest Plan, no proposed roads would occur on slopes greater than 67 percent gradient, or on unstable soils. All new roads would be temporary roads (built to minimum size and width with fewer turnouts) and would be closed with culverts removed and waterbars added at the end of the sale (refer to Issue 4 – Cumulative Effects on Watersheds and the Transportation section of

this chapter for more information on culverts and closures). There is no mechanism provided for future maintenance on temporary roads. Therefore, proper closure of these roads is critical for maintaining hydrologic conditions adjacent to the road.

Reconstruction of existing roadbeds is also necessary on up to 6.9 miles of road in Alternative 5. Additional effects to soil productivity are expected to be minimal because the road prism is still in place. Sediment may be mobilized, but it is expected to be minimal and would be mitigated with Best Management Practices (BMPs). See Issue 4 – Cumulative Effects on Watersheds in this chapter and the Unit Cards in Appendix B).

Table 3 - 77. Miles of road constructed by alternative for each MMI class.

MMI Class	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
1 – Low	0	0.8	1.3	5.8	3.8
2 - Moderate	0	2.1	5.9	13.2	13.3
3 – High	0	0	0	0	0
4 - Extreme	0	0	0	0	0

About 6.8 miles and 33 acres of Forest Roads 6413 and 46096 in Saginaw Basin would be placed in storage under all alternatives. This road closure would reduce hydrologic impacts from the roads when natural drainage patterns are restored (See Issue 4: Cumulative Effects on Watersheds in this chapter). In areas where roads cross wetlands, some wetland functions would be restored.

3.9.7.4 Best Management Practices (BMPs)

Section 313 of the Clean Water Act and Executive Order 12088 require that BMPs are consistent with State Forest Practices and that other applicable State Water Quality Regulations be used to mitigate the impacts of land-disturbing activities. Site-specific application of these BMPs are designed with consideration of geology, land type, hydrology, soil type, erosion hazard, climate, cumulative effects, and other factors in order to protect and maintain soil productivity, and water-related beneficial uses. BMPs recommended during the planning process are shown on the unit cards in Appendix B. Additional protective measures may be applied during timber sale layout or during harvest activities as needed.

3.9.8 Effects by Alternative

3.9.8.1 Alternative 1

Alternative 1 proposes no new road construction, no timber harvest and no road closure(s). This alternative would not result in soil disturbance or mass movement as a result of managed activities. Under this No Action Alternative, the Saginaw Basin roads would remain open and although selection of this alternative would not preclude regular maintenance of existing roads, it should be noted that natural events and area traffic could induce erosion on these roads.

3.9.8.2 Alternative 2

Alternative 2 has the lowest potential of increased landslides within the action alternatives.

Alternative 2 would construct about 2.9 miles of temporary road to access timber. Road construction would remove approximately 14 acres of land from soil productivity through soil disturbance. Approximately 25 acres of detrimental soil conditions would be created as a result of yarding methods (expected through soil displacement, erosion, or lack of vegetative cover). Note that the projection of soil disturbance is based on clearcut harvest; this alternative proposes clearcutting on 40 percent of harvest acres. Therefore detrimental soil impacts are likely to be less than the above calculations. When soil impacts from road construction and harvest are combined approximately 39 acres of detrimental soil impacts could occur as a result of implementing Alternative 2.

Harvest is proposed on 146 acres of MMI-1 soils, 329 acres of MMI-2 soils, 2 acres of MMI-3 soils, and 14 acres of MMI-4 soils. Units 207, 208b, 209, and 416 account for 70 percent of the MMI-2 soils, Unit 207 accounts for all 14 acres of MMI-4 soils. Over the next 20 years the predicted rate of increase for landslides would be 0.647 additional slides over the no action alternative. The risk of landslides and detrimental disturbance is minimized by applying BMPs and Forest Plan standards and guidelines.

Harvest prescriptions to retain 50 percent of the basal area would be applied to 294 of the 491 acres proposed, including all the MMI-4 soils within units. This harvest prescription allows root systems from standing trees to contribute to slope shear strength, which may reduce detrimental soil disturbance and help lessen landslide potential.

3.9.8.3 Alternative 3

Alternative 3 has the second lowest potential of increased landslides within the action alternatives.

Alternative 3 proposes about 7.2 miles of temporary road construction to access timber. Road construction would remove about 35 acres from soil productivity due to soil disturbance. Approximately 40 acres of

detrimental soil conditions would be created as a result of yarding methods (expected through soil displacement, erosion, or lack of vegetative cover). Note that the projection of soil disturbance is based on clearcut harvest; this alternative proposes clearcutting on 52 percent of the harvest acres. Therefore detrimental soil impacts are likely to be less than the above calculations. When soil impacts from road construction and harvest are combined approximately 75 acres of detrimental soil impacts could occur as a result of implementing Alternative 3.

Harvest is proposed on 115 acres of MMI-1 soils, 669 acres of MMI-2 soils, 2 acres of MMI-3 soils, and 8 acres of MMI-4 soils. Of the units on the MMI-2 soils, the largest acreage is in Units 204, 207, 208, and 209. Unit 207 accounts for all 8 acres on MMI-4 soils. Within the next 20 years, the predicted rate of increase for landslides would be 1.134 additional slides over the no action alternative. The risks of landslides and detrimental disturbance are minimized by applying BMPs and Forest Plan standards and guidelines.

Harvest prescriptions which retain 50 percent of the basal area would be applied to 385 of the 794 acres proposed in the harvest area including all the MMI-4 soils within units. This harvest prescription allows root systems from standing trees to contribute to slope shear strength, which may reduce detrimental soil disturbance and help lessen landslide potential. Unit boundary lines were also modified during the planning process to avoid V-notches where erosion could impact streams.

3.9.8.4 Alternative 4

Alternative 4 has the highest potential of increased landslides among the action alternatives.

Alternative 4 proposes more road construction and harvest than any other alternative. It is therefore likely to generate more soil disturbance and landslides than any of the other alternatives.

Nineteen miles of temporary road would be constructed to access timber. Road construction would remove approximately 92 acres from soil productivity through soil disturbance. Approximately 68 acres of detrimental soil conditions would be created as a result of yarding methods (expected through soil displacement, erosion, or lack of vegetative cover). Note that the projection of soil disturbance is based on clearcut harvest; this alternative proposes clearcutting on 72 percent of harvest acres. Therefore detrimental soil impacts are likely to be less than the above calculations. When soil impacts from road construction and harvest are combined, approximately 160 acres of detrimental soil impacts would occur as a result of implementing Alternative 4.

Harvest is proposed for 374 acres of MMI-1 soils, 999 acres of MMI-2 soils, and 52 acres of MMI-4 soils. No harvest is proposed on MMI-3 soils. Within the next 20 years, the predicted rate of increase for landslides would be 2.028 additional slides over the no action alternative. The risk of landslides and detrimental disturbance is minimized by applying BMPs and Forest Plan standards and guidelines.

Alternative 4 includes harvest prescriptions to retain 50 percent of basal area on units in 399 of the 1,425 acres proposed for harvest, including 170 acres of helicopter harvest yarding.

Based on research mentioned previously by Swanston and Marion (1991) (estimating 3.5 times more landslides in harvested areas) and the landslide analysis conducted within the *Kuiu Island Landscape Assessment* (2005) landslide potential is greatest for this alternative, especially on the 52 acres of MMI-4 soils. Alternative 4 would clearcut harvest 16 acres of MMI-4 soils in Unit 101. The remaining 36 acres of MMI-4 soils (in Units 303, 305, and 207) would be partial harvest with 50 percent retention.

3.9.8.5 Alternative 5

Alternative 5 has the second highest potential of increased landslides within the action alternatives.

Alternative 5 proposes about 17.1 miles of temporary road construction to access timber. Road construction would remove about 83 acres from soil productivity through soil disturbance. Approximately 62 acres of detrimental soil conditions would be created as a result of yarding methods (expected through soil displacement, erosion, or lack of vegetative cover). When soil impacts from road construction and harvest are combined approximately 145 acres of detrimental soil impacts would occur as a result of implementing Alternative 5.

Harvest is proposed on 299 acres of MMI-1 soils, 914 acres of MMI-2 soils, two acres of MMI-3 soils, and 16 acres of MMI-4 soils. Unit 101 accounts for all of the MMI-4 soils. Within the next 20 years, the predicted rate of increase for landslides would be 1.615 additional slides over the no action alternative. All of the proposed harvest is even-aged clearcut harvest.

Minimizing the risk of landslides and detrimental soil disturbance is addressed by applying BMPs and Forest Plan standards and guidelines. This alternative would clearcut harvest all the available timber (trees greater than 9 inches dbh) within the units.

Unit boundary lines were also modified during the planning process to avoid V-notches where erosion could impact streams.

3.9.9 Cumulative Effects

Cumulative effects of the proposed actions on long-term soil productivity are directly related to the amount of soil disturbance that occurs through time. The extension of the road and harvest network on North Kuiu by the action alternatives adds to existing disturbance. Currently, no additional entries are expected within the project area during this planning cycle.

It is recommended in the *Kuiu Island Landscape Assessment* (2005) that Roads 6413 and 40696 within the Saginaw Basin be closed. Road failures in the area are evidenced by tension cracks, washed-out culverts and filled ditches. All proposed temporary roads would be decommissioned after harvest in the action alternatives (see the Transportation section in this chapter).

Within the project area there are currently 1,030 acres of detrimental soil impacts from past management activities (roads, detrimental soil conditions in harvest units and landslides). Because Alternative 4 impacts soils more than any other alternative, its effects will be analyzed for cumulative effects.

Combining Alternative 4 (estimated at 160 acres of detrimental soil conditions) with impacts from past activities (1,030 acres) yields approximately 1,190 acres of cumulative detrimental soil impacts or 11 percent of the managed areas with the Kuiu Timber Sale Area. The amount is within the Region 10 Soil Quality Standards 15 percent threshold (FSM 2554-3-10). Thus, soil productivity would be maintained under all alternatives.

A key to keeping detrimental impacts of the soil resource to a minimum is the proper closure of the temporary roads following construction and use. Maintaining natural drainage patterns along the road system reduces the effective footprint of the road and minimizes potential for road related mass wasting and impacts to surrounding streams.

The Crane and Rowan Mountain Timber Sales Record of Decision was signed in July 1998. The area encompasses VCUs 398, 399, 400, 402, 421 and a portion of 420. Approximately 20.1 mmbf of the Crane Timber Sale has been harvested. The Rowan Mountain Sale (20.2 mmbf) and Road 6402 sale (9.5 mmbf) were mutually cancelled in 2004. This volume may be reoffered in other sales. Six of these units are within the Kuiu Timber Sale Area.

- In VCU 400 there are a total of 5 units equaling 389 acres of two aged management with partial harvest. Trees less than 16 inches DBH and over 36 DBH would be left within the units. The logging system used would be helicopter harvest.

- In VCU 399 there is one unit of 64 acres. Fifty acres would be even-aged management clearcut and 14 acres would be two-aged management with partial harvest.

The above 453 acres of harvest would create an additional 15 acres of detrimental soil condition equaling 1,205 acres of detrimental soil impacts over 12,342 acres, or 10 percent of the Kuiu Timber Sale Area.

It is not known when or if these units would be harvested. However, when the cumulative harvest of these units is included in the detrimental disturbance calculation, they would not exceed the 15 percent threshold which is stated in the Forest Service Standards and Guidelines (FSM 2554.03-10).

No other actions are planned in the foreseeable future within the project area. The next scheduled sale area, Bayport, is completely outside the Kuiu Timber Sale Area. The north boundary of Bayport is adjacent to the Kuiu Timber Sale Area's southern boundary (Road 6415). The Three Mile Timber Sale area is on east Kuiu Island, also completely outside of the Kuiu Timber Sale Area.

3.10 Wetlands

3.10.1 Introduction

Wetlands are sites which generally have both saturated soils for at least a portion of the year and vegetation that is adapted to wet sites. They are valued for their physical, chemical and biological functions. Wetlands moderate flooding, reduce runoff and sedimentation, provide wildlife and plant habitat, and may help sustain stream flow during dry periods. Physical functions may include flood conveyance, surface and ground water regulation, sediment retention, and temperature moderation. Chemical functions may include nutrient storage, pH moderation, and carbon storage. Biological functions include habitat for terrestrial, aquatic, and marine plants and animals. Additionally, forested wetlands are an important component of the forestland base.

When working in any wetland area, the Forest Service adheres to the *Army Corps of Engineers Guide for Delineating Wetlands* (1987). Overall, working in wetlands is avoided if possible.

Based on the Soil Resource Inventory approximately 17 percent of the Kuiu Timber Sale Area is classified as wetlands. Most of the wetlands are grouped at the head of Saginaw Bay, the head of Security Bay and at the top of the peninsula separating Security Bay from Saginaw Bay.

3.10.2 Wetland Types

Kuiu Island is a mosaic of forestland and wetlands. Different wetland types are found from sea level to mountain top. Resource values associated with these wetlands vary, depending on biological qualities, proximity to water bodies, and position on the landscape.

Determining what constitutes high value wetlands is largely dependant on human use or the perceived benefit of the wetland. Because human perceptions change, the values we place on wetlands or upland ecosystems also changes over time. There are two wetland habitat types in the Kuiu Timber Sale Area that are considered high value wetlands: Estuaries and Tall Sedge Fens, covering approximately 200 acres. No activities are proposed on these wetland types for this project.

3.10.2.1 Alpine/Subalpine Muskegs (1,027 acres or 2.2%)

These wetlands are located at elevations of 1,200 to 2,500 feet. Vegetation is a combination of muskegs, sedge meadows on peat deposits, and low growing blueberry and heath on higher rises. Stunted lodgepole pine and mountain hemlock are common. These wetlands are important for snow storage and can be a source of snowmelt water throughout the summer. They also provide summer habitat for terrestrial wildlife species.

3.10.2.2 Alpine/Subalpine Forested Wetlands/ Meadow Mosaic (174 acres or 0.4%)

Small patches of alpine shrubs and small trees exist within a matrix of meadow as described above. The trees are stunted lodgepole pine or mountain hemlock.

3.10.2.3 Estuarine Wetlands (60 acres or 0.1%)

Estuaries are unique brackish environments where saltwater mixes with fresh water. They provide high value habitat for vegetation, fish and wildlife. There are two types of estuarine wetlands: (1) emergent wetlands in the upper tidal zone characterized by grasses and sedges and (2) the regularly flooded aquatic algal beds and rocky or unconsolidated shore. Estuaries are protected by Forest Plan standards and guidelines with at least a 1,000-foot buffer. The Forest Service only manages wetlands above mean high tide (Forest Plan).

3.10.2.4 Forested Wetlands (1,736 acres or 3.8%)

Forested wetlands include a number of forested plant communities with hemlock, cedar, or mixed conifer overstory, and ground cover including large amounts of skunk cabbage. Forested wetlands are found on poorly or very poorly drained hydric mineral or organic soils. They are most common on broad glacial valley bottoms and on gently sloping hills or benches. These wetlands function as recharge areas for groundwater and streams, and for deposition of sediment and nutrients. They also produce commercial forest products and exceed Forest Service minimum standards for commercial timberland (Julin and D'Amore 2003).

3.10.2.5 Forested Wetland/Upland Mosaic (21 acres or less than 0.1%)

Small patches of forested wetland as described above interspersed with forested non-wetland ecosystems. Forested wetlands/Upland Mosaics are typically found in concavities on gently sloping or rolling landscapes and function somewhat differently than large, contiguous areas of forested wetland due to their orientation.

3.10.2.6 Muskegs (987 acres or 2.2%)

Muskegs are commonly found in broad valley bottoms and on rounded hilltops. They are dominated by sphagnum moss with a wide variety of other plants adapted to very wet, acidic, organic soils. Drainage varies from poorly drained to very poorly drained, thus the organics are less decomposed than in other wetland systems. They serve as areas high in biological and vegetative diversity and function as large filters, removing nutrients and sediment from recharging groundwater. Muskegs are gently sloped and typically include raised bogs and some shrubby coniferous vegetation with stunted lodgepole pine and hemlock trees less than 15 feet high.

3.10.2.7 Muskegs/Forested Wetlands Mosaic (3,707 acres or 8%)

Small patches of muskegs and forested wetlands as described above form a mosaic on the landscape. These areas have vegetative properties of each of the respective components above but function somewhat differently with respect to habitats, due to their small size and spatial arrangement.

3.10.2.8 Sedge Fens (140 acres or 0.3%)

Sedge fens are characterized by a diverse community of sedges with a variety of forbs and occasionally include stunted trees - usually spruce or hemlock. Soils are typically deep organic muck, often with thin layers of alluvial soil material. They are considered high value wetlands because they occur in landscape positions where they receive nutrient-rich runoff from adjacent slopes creating somewhat richer conditions than bogs or sphagnum muskegs. These wetlands function as areas for recharge of groundwater and streams, deposition and storage of sediment and nutrients, and for waterfowl and terrestrial wildlife habitat. Many sedge fens contain beaver ponds that often provide high quality waterfowl and salmon rearing habitat.

3.10.3 Affected Environment

3.10.3.1 Guidance

Direction was available through the Tongass Land and Resource Management Plan, Forest Plan standards and guidelines p. 4-111, BMP 12.5, Wetland Identification, Evaluation and Protection, and Wetlands Executive Order 11988.

The Forest Service is required by Executive Order 11990 and Section 404 of the Clean Water Act to preserve and enhance the natural and beneficial values of wetlands whenever practicable while carrying out land management responsibilities.

Past harvest from wetland areas in the project area (approximately 325 acres) is minimal. Less than five percent of the previously harvested areas were on wetlands, including forested wetlands and wetland complexes. Less than 15 percent of the roads were built across wetlands to access timber.

3.10.3.2 Timber Harvest

Within wetlands, timber harvest usually only affects forested wetlands and some upland complex areas, as most wetlands do not support productive forest and are not harvested. Impacts to wetlands are generally caused by roads built across wetlands, and are small compared to the amount of wetlands on the Tongass.

Many of the forested wetland soils capable of supporting forests suitable for timber production were included in the suitable timber base during the analysis of the Forest Plan. Site productivity for tree

growth is generally lower than on sites with better drainage. Regeneration is expected to occur within five years, just as with other forested sites (Julin and D'Amore 2003).

Vegetation changes on both low volume old growth and young growth forest stands in a wetland area after a harvest. A small and temporary increase in soil moisture is expected until transpiration and interception of rainfall is equivalent to pre-harvest conditions. These effects are common to all the action alternatives. Table 3-78 displays acres of timber harvest on forested wetland for each alternative.

Table 3 - 78. Acres of wetlands previously harvested and proposed for harvest within the Kuiu Timber Sale Area by alternative

Wetland Type	Existing Managed Stands	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Alpine/Subalpine Muskegs	15	0	0	0	0	0
Forested Wetlands	216	0	15	34	60	66
Muskegs/Forested Wetlands Mosaic	94	0	17	24	57	57
Forested Wetlands/Upland Mosaic	0	0	0	0	2	2
Total Harvest	325	0	32	58	119	125

3.10.3.3 Roads on Wetlands

A direct effect to wetlands is the placement of fill material during the construction of temporary roads. Proposed temporary roads would cross forested wetland in all of the action alternatives and cross muskegs/forested wetlands mosaics in three of the four action alternatives (Table 3-79). This is considered a long term effect on the wetlands area covered by the road prism. There would also be a slight alteration of soil drainage for several feet on either side of the prism, which can be expected to alter vegetation in these regions. Drainage ditches normally collect and divert overland flow and shallow surface flow to the nearest stream channel. Units where wetlands exist would apply BMP 14.9 to direct drainage flow to filter collection areas, rather than allow drainage to enter a stream channel directly. Drainage structures would be removed on all temporary roads after timber harvest is complete.

Table 3 - 79. Proposed temporary road miles crossing wetlands

Wetland Type	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Forested Wetland	0	0.8	0.3	1.1	1.2
Muskeg/Forested Wetland Mosaic	0	0	0.6	1.6	1.6
Total Road Miles to be Constructed on Wetlands	0	0.8	0.9	2.7	2.8

Closing existing roads may restore some of the wetland functions. By removing all drainage structures, installing ditch blocks and additional cross drains through the road prism, natural drainage patterns may also be restored. Revegetation of the road prism by natural species, especially alder, is encouraged. All of the action alternatives would close the roads in Saginaw Basin, including 0.8 miles of road on forested wetland and 0.3 miles of road on Muskeg/Forested Wetlands mosaics. The prism would stay in place but drainage would be reestablished.

3.10.4 Effects by Alternative

3.10.4.1 Alternative 1

Alternative 1 proposes no new road construction, no timber harvest and no road closure. This alternative would not be expected to alter the current wetlands state through management activities.

3.10.4.2 Alternative 2

Alternative 2 proposes about 0.8 miles (3.9 acres) of temporary road on wetlands. There would be harvest on 15 acres on poorly drained forested wetlands (out of 1,736 acres within project area) and 17 acres of moderately drained soils within the muskeg/forested wetland mosaic complex (out of 3,707 acres), neither of which are considered high value wetlands. Due to the large amount of both wetland types within the Kuiu Timber Sale Area and the very small amount that would be impacted during the proposed harvest, the impacts are not considered significant.

3.10.4.3 Alternative 3

Alternative 3 proposes about 0.9 miles (4.4 acres) of temporary road on wetlands. There would be harvest on 34 acres of poorly drained forested wetlands (out of 1,736 acres within project area) and 24 acres of moderately drained soils within the muskegs/forested wetland mosaic complex (out of 3,707 acres), neither of which are considered high value wetlands. Due to the large amount of both wetland types

within the Kuiu Timber Sale Area and the very small amount that would be impacted (0.01 percent) during the proposed harvest, the impacts are not considered significant.

3.10.4.4 Alternative 4

Alternative 4 proposes about 2.7 miles (13 acres) of temporary road on wetlands. There would be harvest on 60 acres of poorly drained forested wetlands (out of 1,736 acres within project area), and 57 acres of moderately drained soils within the muskeg/forested wetland mosaic complex (out of 3,707 acres), neither of which are considered high value wetlands. There are also two acres of forested wetland/upland mosaic wetlands (out of 21 acres) that would be impacted as a result of Alternative 4. Although the two acres accounts for 10 percent of the total acreage of this wetland type within the Kuiu Timber Sale Area, there are 1,844 acres of this wetland type on Kuiu Island (USDA FS 2005). Therefore, the impacts for all three wetlands are not considered as significant.

3.10.4.5 Alternative 5

Alternative 5 proposes about 2.8 miles (13.6 acres) of temporary road on wetlands. There would be harvest on 66 acres of poorly drained forested wetlands (out of 1,736 acres within project area), and 57 acres of moderately drained soils within the muskeg/forested wetland mosaic complex (out of 3,707 acres), neither of which are considered high value wetlands. There are also two acres of forested wetland/upland mosaic wetlands (out of 21 acres) that would be impacted as a result of Alternative 5. Although the two acres accounts for ten percent of the total acreage of this wetland type within the Kuiu Timber Sale Area, there are 1,844 acres of this wetland type on Kuiu Island. Therefore, the impacts for all three wetlands are not considered significant.

3.10.5 Cumulative Effects

The proportion of wetlands to be impacted in all alternatives is considerably less than the total amount of wetlands available in the area and cumulative effects are expected to be minor. Many of the high value wetland habitats on the Tongass National Forest are protected either by land use designations or by standards and guidelines specifically addressing wetlands. Estuarine wetlands, for example, are protected by beach buffer standards and guidelines. Cumulative impacts to wetlands include the harvest units in each alternative added to the approximately 325 acres of past harvest on wetlands.

The Record of Decision for the Crane and Rowan Mountain Timber Sales Final EIS was signed in July 1998. The area encompasses VCUs 398, 399, 400, 402, 421 and a portion of 420. Approximately 20.1 mmbf of the Crane Timber Sale has been harvested. The Rowan Mountain Sale (20.2 mmbf) and Road 6402 sale (9.5 mmbf) were

mutually cancelled in 2004. These acres may be reoffered in other sales. Six of these units are within the Kuiu Timber Sale Area. These units are off of existing roads or helicopter units and no additional road building is proposed.

It is not known at this time if or when these units may be harvested. However calculations for detrimentally disturbed soil which include the harvest of these units show that the project area would still be well below the Forest Plan standards and guidelines which state that no more than 15 percent of an activity area can be detrimentally disturbed through management practices.

No other actions are planned in the foreseeable future within the Kuiu Timber Sale Area. The next scheduled sale area, Bayport, is completely outside the Kuiu Timber Sale Area. The north boundary of Bayport is the southern boundary (Road 6415) for the Kuiu Timber Sale Area. Although planning for the Bayport project has not begun, it is assumed that the existing LTF in Rowan Bay would be used. Currently, it is not possible to estimate the amount of wetlands that may be affected. It is likely that this proposed timber sale would require some road construction and possible that road building would result in the direct loss of small amounts of wetland habitat.

The Threemile Timber Sale Area is in east Kuiu Island and entirely outside the Kuiu Timber Sale area. The selected alternative for Threemile EIS proposes harvest on 76.3 acres of wetland, construction 1.9 miles of new road, which would disturb 5.5 acres of wetland; and closure of 2.5 miles of road on wetland, restoring some of the functions.

Cumulative effects to wetlands resulting from this project and reasonably foreseeable projects are expected to be minor. While effects to wetlands from road construction associated with this project and foreseeable projects may be long lasting, they are expected to be of limited extent and of little consequence when considering the abundance of wetlands that would not be affected by these projects. Effects from timber harvest on wetland habitats are expected to be temporary. After timber harvest, it is expected that wetland function and habitat characteristics would be restored through natural processes of vegetation growth and succession.

3.11 Transportation

3.11.1 Introduction

Forest roads are planned either for long-term management or for temporary use and are classified as follows:

- **Classified roads** are developed and maintained for long-term land and resource management purposes and for public use.
- **Unclassified roads** are not managed as part of the forest transportation system. These include unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail. Roads that are no longer under permit or other authorization and have not been decommissioned are also considered unclassified.
- **Temporary roads** are constructed and used for a limited time period. When the road is no longer needed, the road bed is decommissioned (returned to a more natural condition).

Decommissioning can occur for classified, unclassified, and temporary roads. Decommissioning for classified roads removes the road from the classified road system. Otherwise, decommissioning is the same for all roads. Action on the ground for decommissioning ranges from the minimum action of blocking the entrance and removing drainage structures to the maximum action of obliterating the road, returning the natural contours, and replanting vegetation.

3.11.2 Road Analysis Process

Part of the analysis of the Kuiu Timber Sale Area is to identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands. The minimum system is the road system determined necessary to:

- meet resource and other management objectives adopted in the Tongass Land and Resource Management Plan,
- meet applicable statutory and regulatory requirements,
- reflect long-term funding expectations, and
- ensure that the identified system minimizes adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance.

The Road Analysis Process (RAP) for the Kuiu Timber Sale Area is a tiered, science-based system of analysis. The first layer is the Forest Wide RAP, which is an analysis of the whole Tongass National Forest. The second layer is the Kuiu Road Analysis which includes the Kuiu Timber Sale Area.

The recommendations for the roads in the Kuiu Timber Sale Area are detailed on the Road Cards in Appendix B and will become part of the Record of Decision. Each of the roads shown in Appendix B is considered necessary for long-term management of the forest, on either an intermittent or constant basis.

Table 3 - 80. Existing classified roads in the Kuiu Timber Sale Area

Road #	Length (Miles)	Status	Road	Length (Miles)	Status
6402	14.5 (includes 1.1 miles outside project area)	Open	**6417**	3.67	Closed
6448	0.81	Open	**6443**	1.3	Closed
46252	1.10	Closed	**6422**	0.24	Closed
46251	2.13	Open	**6401**	1.03	Open
6425	6.47	Closed past MP 4.65	**46094**	1.58	Closed
6403	0.37	Closed	**46091**	1.58	Closed
6441	1.73	Open	**46152**	2.05	Closed
6442	0.75	Closed	**46154**	0.54	Closed
46098	0.42	Closed	**6415**	18.51	Open
6427	3.44	Closed past MP 1.15	**6421**	0.46	Closed
6413	2.84	Open	**6419**	0.39	Closed
46096	3.80	Open	**46127**	1.43	Closed
6418	1.70	Open	**6411**	0.80	Open
46021	1.38	Open	**46420**	2.27	Open
6404	4.4 miles outside project area	Open			

3.11.3 Existing Roads

The existing roads in the Kuiu Timber Sale Area are connected to a contiguous road system consisting of approximately 190 miles of classified roads on the northern portion of Kuiu Island. None of these roads connect to any community, other public roads, or other public transportation system. All of the forest roads were constructed in support of timber sales and connect to Log Transfer Facilities (LTFs) in Rowan Bay and Saginaw Bay.

The Kuiu Timber Sale Area has approximately 76 miles of existing National Forest System Roads, including 4.4 miles of Road 6404 that runs from Rowan Bay LTF to Road 6402 (outside the project area). Approximately 1.1 miles of Road 6402 is outside the project area and connects the project area to Road 6404. These roads are included in this analysis because they could be used for both administration traffic to access the area and may be used for log haul to Rowan Bay LTF, if an action alternative is selected. Approximately 56.2 miles of roads within the project area are open and drivable. Table 3-80 lists the roads in the project area and their status.

Most of the road use on the island is either administrative or logging traffic. Because of Kuiu Island's remote location, there is very little public traffic although some public traffic occurs from outfitter\guides and some subsistence hunting.

3.11.4 Closing Existing Roads

3.11.4.1 Road Density

The Kuiu Timber Sale Area comprises approximately 72 square miles, with 56.2 miles of existing open road in the project area. This equates to an open road density of 0.78mi/mi^2. The action alternatives would physically close between 8.2 and 11 miles of existing classified roads that are currently open in the project area. These closures were recommended in the *Kuiu Island Landscape Assessment* (2005). The closed roads would be placed into storage by removing culverts and bridges, and restoring natural drainage patterns. These roads could be re-opened by filling in the trenches and re-installing stream crossing structures as needed. This project would decrease the mileage and density of permanent roads left open after timber harvest in each alternative except the no-action alternative, as shown in Table 3-81.

Table 3 - 81. Current and proposed open road density in the Kuiu Timber Sale Area

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Current open road density (mi/mi^2)	**0.78 miles per square mile**				
Proposed open road density (mi/mi^2)	0.78	0.67	0.66	0.63	0.63

Table 3 - 82. Existing and proposed miles of open and closed classified road and miles of proposed temporary road construction in the Kuiu Timber Sale Area

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Miles of open classified road	56.2	56.2	56.2	56.2	56.2
Miles of closed classified road to be temporarily opened for harvest	0	4.5	3.2	6.1	6.9
Miles of existing open classified road to be placed into storage	0	8.2	8.4	11.0	11.0
Miles of open classified road after harvest	56.2	48.0	47.8	45.2	45.2
Miles of temporary road construction	0	2.9	7.5	19.0	17.1
Total road costs ($1000s)	$0	$321	$1,074	$1,370	$1,474

3.11.5 Proposed New Roads

There are no new classified roads proposed in any of the alternatives for this project. The action alternatives propose between 2.9 and 19 miles of temporary road construction to access timber harvest units (Table 3-82). All temporary roads would be decommissioned after timber harvest is complete in all alternatives. The construction of temporary roads was chosen over the construction of classified roads for this project because it was determined there was no need for long-term motor vehicle access along these roads.

To provide access to timber harvest units, all of the action alternatives would reconstruct between 3.2 and 6.9 miles of existing classified roads that are currently closed. All of these reconstructed roads would again be closed and put into storage after timber harvest is complete (Table 3-83).

Table 3-83. Existing classified road closures

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Roads currently drivable and/or with structures					
6413	0	2.7	2.7	2.7	2.7
46096	0	4.1	4.1	4.1	4.1
6427	0	0	0	1.2	1.2
46021	0	1.4	0	1.4	1.4
6418	0	0	1.6	1.6	1.6
Total Miles	**0**	**8.2**	**8.4**	**11.0**	**11.0**
Roads currently in storage to be opened to access units(s)					
6417	0	2.5	1.3	2.5	2.5
6427	0	0	0	2.2	2.2
46091	0	1.1	1.1	1.1	1.1
46094	0	0.8	0.8	0	0.8
6422	0	0	0	0.2	0.2
6443	0	0.1	0	0.1	0.1
Total Miles	**0**	**4.5**	**3.2**	**6.1**	**6.9**

All roads, both existing and proposed, would be located, designed, constructed or reconstructed, and maintained following Best Management Practices (BMPs). Refer to the Road Management Objectives in Appendix B of this Draft EIS for more information on specific BMPs.

3.11.6 Other Facilities

3.11.6.1 Log Transfer Facilities (LTFs)

The transfer of harvested timber requires that logs be hauled to a site where they can be removed from trucks, transferred to saltwater for rafting or loaded onto barges, and then towed to a mill. These sites are termed "log transfer facilities," or "marine access points." There is one

LTF on the north end of the project area, Saginaw LTF, and one approximately five miles south of the project area, Rowan Bay LTF.

To access the Rowan Bay LTF would require log haul over existing Roads 6402 and 6404, a distance of approximately 5.5 miles outside the project area. The Rowan Bay LTF is a steel piling bulkhead that was designed for use with a barge for loading logs. The Rowan Bay LTF is in good condition and would require no reconstruction for log transportation or storage. The barging of logs may be recommended in order to minimize bark deposition in Rowan Bay. Timber could still be rafted when barge costs versus log volume make barging cost-prohibitive.

To access the Saginaw Bay LTF would require log haul over existing Roads 6402 and 6448, both of which are inside the project area. The Saginaw Bay LTF was designed to place the logs in the water for rafting. The LTF will need reconstruction before any use.

Current permits for the construction and use of the LTFs include:

- Section 10 of the Rivers and Harbors Act of 1899 Corps of Engineers approval for the construction of structures or work in navigable waters of the United States
- Tidelands permit from the State of Alaska, Department of Environmental Conservation
- Certification of compliance with Alaska Water Quality Standards (Section 401 Certification) from the State of Alaska, Department of Environmental Conservation
- Storm Water Discharge Permit and a permit for discharge of bark and wood debris from the US EPA (Section 402 of the Clean Water Act)

3.11.6.2 Sort Yard

There is a sort yard of approximately 12 acres located on the uplands adjacent to the Rowan Bay LTF. Due to its size and convenient location, it is not expected that any other sort yard would be needed for any of the alternatives if Rowan Bay is used as the LTF site.

There is an existing storage yard adjacent to Saginaw Bay LTF for storing the 100 to 200 mbf barge loads, which may require some expansion of the area. In addition to the storage area, a sort yard at the end of Road 6448 approximately one mile from the Saginaw LTF site is proposed for log sorting prior to storage at the LTF site. This sort yard would be located at the old logging camp site. This area is currently covered in alders, but the surface underneath is shot rock. The sort yard site would be approximately 400 x 800 feet in size and located on the existing flat terrain already surfaced with shot rock.

3.11.6.3 Logging Camp

There is an existing land camp at Rowan Bay about one mile south of the LTF. The camp has an Alaska Department of Environmental Conservation approved water and sewer system. This would be a typical camp for any timber operator that worked in this area. A floating camp could also be used during harvest activities. Appropriate permits would need to be acquired by the operator.

3.11.6.4 Forest Service Facilities

There is a Forest Service administrative site located near the Rowan Bay logging camp. This site has a bunkhouse/office building and a separate equipment/generator building. The administrative site is used by Forest Service employees working in the Rowan Bay area.

3.11.6.5 Rock Quarries

There is a need for a rock source during the construction of the temporary roads and also for the maintenance of the existing classified roads on this project. The accessibility of existing rock quarries would eliminate the need to develop any new rock quarries. Existing rock quarries would be used and expanded for any new construction or existing road maintenance as needed.

3.11.7 Direct and Indirect Effects by Alternative

3.11.7.1 Alternative 1

The maintenance of existing roads would not change. Existing open roads would not be placed into storage and no new roads are proposed.

3.11.7.2 Alternative 2

Alternative 2 proposes construction of 2.9 miles of temporary road. All temporary roads would be decommissioned after timber harvest. No new classified roads designed for long-term use would be built. Three existing open classified roads, about 8.2 miles, would be closed and placed in storage after timber harvest is complete. Reconstruction of 4.5 miles on four roads that are currently closed would consist of filling in trenches and reinstalling culverts across stream crossings. These structures would be removed after logging operations are done and drain ditches would be added to move water off the road bed.

3.11.7.3 Alternative 3

Alternative 3 would construct 7.5 miles of temporary roads which would be decommissioned after timber harvest. No new classified roads designed for long-term use would be built. Three existing open classified roads, about 8.4 miles would be closed and placed in storage after timber harvest is complete. Reconstruction of 3.2 miles on three existing roads that are currently closed would consist of filling in trenches and reinstalling culverts across stream crossings. These structures would be removed after logging operations are done and drain ditches would be added to move water off the road bed.

3.11.7.4 Alternative 4

Alternative 4 would have the most construction, with 19.0 miles of temporary road. No new classified roads designed for long-term use would be built. About 11 miles on five existing classified roads would be closed and placed in storage condition after timber harvest is complete. All of the temporary roads would be decommissioned after timber harvest. Reconstruction of 6.1 miles on five existing roads that are currently closed would consist of filling in trenches and reinstalling culverts across stream crossings. These structures would be removed after logging operations are done and drain ditches would be added to move water off the road bed.

3.11.7.5 Alternative 5

Alternative 5 would construct the second most miles of temporary roads, with 17.1 miles of construction. No new classified roads designed for long-term use would be built. As with Alternative 4, about 11 miles on five existing classified roads would be closed and placed in storage after timber harvest is complete. All of the temporary roads would be decommissioned after timber harvest. Reconstruction of 6.9 miles on six existing roads that are currently closed would consist of filling in trenches and reinstalling culverts across stream crossings. These structures would be removed after logging operations are done and drain ditches would be added to move water off the road bed.

3.11.8 Cumulative Effects

The effects of the transportation system on other resources are considered in the specific resource sections. This section focuses on the impacts of road construction as related to length and density of roads.

None of the action alternatives add new classified roads to the system. All of the action alternatives would remove varying amounts of existing open road from the system by placing these roads into storage after timber harvest.

Closing some existing roads in the project area would have beneficial effects to water quality, and would reduce the amount of road maintenance required in the project area. The amount of road use in the area is not expected to change significantly as a result of these closures. The roads which are currently open and proposed for closure receive very little use. The decrease in road density should result in some effects to other resources, but any effects would probably be beneficial and would continue to increase with time.

A potential effect of LTF use is the accumulation of log debris and bark in the marine environment. Bark accumulation can affect habitat for bottom-dwelling creatures, as well as hamper underwater vegetation used as food and as rearing sites for marine fish and other

organisms. Please refer to Section 3.8 Fisheries of this chapter for information regarding the 303(d) status of the LTFs.

Road density is defined as the number of miles of open roads within a square mile. This is one indicator of environmental impacts. With a higher road density, there can be a greater risk of impact. These risks are minimized and mitigated by standards and guidelines, which direct the road location, design, construction, maintenance and operation.

The Kuiu Timber Sale Area comprises approximately 72 square miles, and there are currently 56.2 existing open road miles in the project area. This equates to a road density of 0.78 mi/mi^2. This project would decrease the amount of classified roads left open after timber harvest in each alternative except the no-action alternative, as shown in Table 3-81.

3.12 Scenery

Scenery is an important aesthetic quality of Tongass National Forest System lands. The Forest Plan recognizes this and addresses the degree of acceptable alteration of the landscape by assigning Visual Quality Objectives to each land use designation. These objectives are based on the visibility of the landscape from identified Visual Priority Routes and Use Areas listed in Appendix F of the Forest Plan, and incorporate the management objectives of the land use designations.

3.12.1 Visual Character

Southeast Alaska scenery encompasses mountains, glaciers, water, sky, weather, trees, animals, boats, people, and development. While there are an infinite number of personal interpretations of scenery, the Forest Plan assumes general preferences based on cultural norms and predominant social values. The quality of the scenic environment can be categorized in terms of visual character types.

3.12.1.1 Character and Variety Class

Visual character types provide a framework for defining the quality or distinctiveness of scenery. Each character type contains unique features of landform, vegetative patterns, water forms, or geologic features. The greater the diversity of form, line, texture, and color in a landscape, the greater the scenic value. There are six distinct visual character types represented on the Tongass National Forest. North Kuiu Island lies within the Kupreanof Lowland visual character type. North Kuiu Island is distinguished in landscape character by rolling terrain of between 300 and 1,500 feet elevation dissected by an intricate network of waterways. Scattered block-like mountains, with rounded hummocky summits 2,000 to 3,500 feet in el .ation rise above the general level of the lowlands which consist primarily of muskeg. The natural landscape within character types is described in terms of scenic value and placed into three variety class designations (USDA Forest Service 1973). The variety classes are described below and the acres of each variety class in the project area are displayed in Table 3-84.

- **Variety Class A:** Kupreanof Lowland, Distinctive. Diverse blocky terrain; highly varied vegetative patterns; prominent bays and inlets and intricate island reef complexes, diverse shorelines with exposure to high energy seas.
  The amount of Variety Class A within the project area is quite small and confined to an area of shoreline in upper Security Bay.
- **Variety Class B:** Kupreanof Lowland, Common. Rounded to occasionally blocky terrain that is often penetrated by major bays or inlets; secondary peaks, escarpments, wave cut formations, and small beaches; moderately varied vegetative patterns; and

somewhat diverse shorelines and associated saltwater features, small distinctive lakes or pond clusters, secondary streams and waterfalls. The amount of Variety Class B encompasses approximately 59 percent of the project area and consists of the forested mountain slopes.

- **Variety Class C:** Kupreanof Lowland, Minimal. Uniformly low rolling to occasionally hummocky terrain indented by minor bays and coves; insignificant geologic formations, such as minor wave cut formations and small rock outcrops; minor lakes, ponds, bogs, and streams.
  Variety Class C encompasses approximately 41 percent of the project area and consists of relatively flat terrain scattered throughout the project area.

Table 3 - 84. Project area acres by variety class

Variety Class	Acres
Class A – Distinctive	291
Class B – Common	27,336
Class C – Minimal	18,475
Kuiu Project Area Total	**46,102**

3.12.2 Visual Priority Travel Routes and Use Areas

The Forest Plan has identified specific locations from which scenery is viewed, reflecting high visitor use and a greater public concern for scenic quality. Visual Priority Travel Routes and Use Areas are used to assess scenic condition and the locations from which scenic value is to be emphasized. Locations visible from priority travel routes and use areas are described in scenery resource terms as the "seen area." "Seldom seen" or "not seen" areas are defined as those locations not viewed from any position along a Visual Priority Travel Routes and Use Area.

Sensitive viewing locations from which scenic quality will be measured include Rowan Bay, Security Bay, Saginaw Bay, Kadake Bay, and Kadake Creek. A Forest Service cabin is located at the mouth of Kadake Creek. Kadake Creek has been recommended in the Forest Plan for designation as a Recreational River under the Wild and Scenic Rivers Act. The project area is also viewed at a distance (3-5 miles) from Frederick Sound, but is seen in closer proximity from either Saginaw Bay or Security Bay where the potential effects would be greater.

All the Visual Priority Travel Routes and Use Area destinations surrounding the project area receive intermittent to moderate use over the course of the year, much of which is seasonal in nature. Those viewing the landscapes are primarily passengers of: the Alaska Marine Highway System, commercial fishing vessels, fishing and whale watching charter boats, and small recreational boats involved in camping, hunting, fishing, or subsistence activities.

3.12.2.1 Visibility and Distance Zones

Visibility, mapped in terms of distance zones, is a measure of how visual changes are perceived in the landscape. Changes in form, line, color, and texture become less perceptible with increasing distance. The Forest Service describes visibility in terms of three distance zones: foreground, middleground, and background (USDA FS 1974). Each distance zone listed below describes the level of detail or change that is typically perceived when viewing the landscape. Project area visibility from Visual Priority Travel Routes and Use Areas is displayed in Table 3-85.

Foreground: (0 - ½ mile from the viewer) – The portion of the seen area in which detail in the landscape becomes noticeable. Foliage and fine textural details of vegetation are normally perceptible within this zone. Foreground viewing areas include a portion of the Security and Saginaw Bay shoreline and areas within the Kadake Creek river corridor.

Middleground: (½ - 3 to 5 miles from the viewer) - The portion of the seen area in which details of foliage and fine textures cease to be perceptible and objects in the landscape are perceived mainly by their form. Vegetation appears as outlines or patterns. Middleground viewing of the project area includes most of the prominent forested ridges visible from saltwater.

Background: (3-5 miles and greater) - The portion of the seen area where texture and color are weak, and landforms become the most dominant element. Background views of the mountain ranges frame the horizon in this landscape. The visual elements of line and form are dominant. Strong color contrasts of sufficient size may still be noticeable. There are no background viewing locations inventoried within the project area.

Not Seen: Those landscapes within the project area that are not visible from Visual Priority Travel Routes and Use Areas as a result of topographic relief or other physical attributes are classified as not seen.

Approximately 70 percent of the project area is categorized as not seen from Visual Priority Travel Routes and Use Areas.

Table 3 - 85. Acres of harvest in seen areas by alternative

Distance Zone	Alt 2	Alt 3	Alt 4	Alt 5
Foreground	18	0	49	0
Middleground	144	246	500	455
Background	0	0	0	0
Not Seen	329	548	876	776
Total Harvest Acres	**491**	**794**	**1,425**	**1,231**

3.12.3 Existing Condition

3.12.3.1 Existing Visual Condition

Existing Visual Condition (EVC) describes the visual appearance of the landscape at the time the assessment is conducted. It excludes the context of whether the landscape is seen or not seen from visual priority travel routes and use areas and indicates the amount of change that has occurred in the past, and what level of change may be acceptable in the future. The EVC is used as a baseline from which to evaluate the acceptable desired future condition and cumulative effects outlined in the Forest Plan management prescription criteria. There are six types of landscapes ranging from pristine to intensively modified:

- **Type I:** Landscapes where only ecological change has occurred, except for trails needed for access. Landscapes appear to be untouched by human activities.
- **Type II:** Landscapes where change is not noticed by the average forest visitor unless pointed out. These landscapes 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. 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, but are shaped to resemble natural patterns.

- **Type VI:** Landscapes where changes are in strong contrast to the landscape's natural appearance. Changes appear as dramatic, large scale disturbances that strongly affect the average forest visitor.

The majority of the Kuiu Timber Sale Area is in a Type V category due to the amount of timber harvest that has occurred over the past 20 years. This condition is not nearly as apparent when viewed from saltwater locations where regeneration of the larger and older logging units begins to visually recover. The Type V condition is a reflection of the desired future condition for the Timber Production LUD. Acres of EVC types within the project area are displayed in Table 3-86.

Table 3 - 86. Project area acres by existing visual condition

Existing Visual Condition	Acres
Type I	8,484
Type II	434
Type III	36
Type IV	8,023
Type V	25,020
Type VI	4,105
Kuiu Timber Sale Area Total	46,102

3.12.3.2 Visual Absorption Capacity

Visual Absorption Capacity (VAC) is an estimate of the relative ability of a landscape to absorb change resulting from timber harvest. VAC incorporates elements of slope, distance zone, visibility, and landscape complexity in measuring this capacity for change. The Forest Plan management prescriptions provide direction in determining the maximum harvest treatment within development areas by utilizing VAC classes. The classes are low, intermediate, and high, reflecting the capacity of the landscape to absorb change. The acres of visual absorption capacity classes within the project area are displayed in Table 3-87.

Table 3 - 87. Project area acres by Visual Absorption Capacity Class

Visual Absorption Capacity Class	Acres
Low	4,249
Intermediate	11,906
High	29,947
Kuiu Timber Sale Area Total	**46,102**

3.12.3.3 Visual Quality Objectives (VQO)

Visual Quality Objectives (VQOs) provide measurable standards to assess the scenery resource based on landform characteristics and levels of public concern. VQOs are established by incorporating the previously defined visual resource elements of variety class, viewing sensitivity, and distance zone. Adopted VQOs are established during the forest planning process. Adopted VQOs help govern the location, design, scheduling, and level of management activities such as timber harvest to achieve or maintain the desired future condition. The Forest Plan adopted the following four VQOs as management direction:

- **Retention -** Changes in the landscape are not visually evident to the average forest visitor.
- **Partial Retention -** Changes in the landscape may be evident to the casual observer but appear as natural occurrences when contrasted with the appearance of the surrounding landscape.
- **Modification -** Changes in the landscape appear very evident but incorporate natural patterns of form, line, color, and texture when contrasted with the appearance of the surrounding landscape.
- **Maximum Modification -** Changes in the landscape appear highly evident and may visually dominate the surrounding landscape, yet when viewed in the background distance these activities appear as natural occurrences.

Adopted VQOs reflect the management objectives of the Forest Plan land use designations (LUDs) incorporating other resource objectives, and also represent a future visual condition planned for a particular landscape. The VQOs within the project area include Maximum Modification and Modification for the Timber Production LUD, Retention for the Old-growth Habitat LUD, and Partial Retention within the Recreational River LUD within the ¼-mile corridor of Kadake Creek (Figure 3-10). Management emphasis would reflect

activities that may appea ghly evident in those areas maximizing timber production and maintaining a natural appearance in other locations. The old-growth habitat reserve would be retained in a natural condition where the retention VQO is applied and no harvest would occur. The acres of Forest Plan VQOs within the project area are displayed in Table 3-88.

Table 3 - 88. Project area acres by Forest Plan adopted visual quality objective

Adopted Visual Quality Objective	Acres
Retention (Old Growth Habitat LUD)	1,245
Partial Retention (Recreational River)	1,595
Maximum Modification (Timber Production LUD)	39,541
Modification (Timber Production LUD)	3,365
Non-National Forest System Lands	356
Kuiu Timber Sale Area Total	**46,102**

3.12.4 Environmental Consequences

Timber harvest within a portion of the project area visible from Visual Priority Travel Routes and Use Areas would be designed and implemented to meet the Forest Plan adopted VQOs. The future visual condition of the affected landscape would be predominantly reflective of the Timber Production LUD, where the primary goal is to manage land for the sustained long-term yield of wood. The visual effects of management activities in this land use designation will be more noticeable than they would be in a land use designation that allows less development.

The visual effects upon scenery from the development associated with timber harvest would be greater than that characteristic of a natural appearing forest environment. Several factors contribute to the degree of visibility of the proposed activities. These factors include: (1) the location from where development is visible, (2) the distance from which the development is observed, (3) the vegetative composition of the surrounding landscape, and (4) the design outcome of the activity.

Each of the action alternatives would result in some degree of change in the appearance of the landscape. Green tree retention within some units would reduce the overall effects. Additionally, all of the proposed timber harvest of any given alternative would not be seen at one time from a single location. Impacts to scenery for all alternatives would remain relatively constant over time as harvested areas regenerate and new stands are removed. All action alternatives would

achieve a higher level of visual quality than the Adopted Visual Quality Objective of Maximum Modification for the majority of the project area.

3.12.5 Direct and Indirect Effects

Each of the action alternatives would result in some visual modification of the landscape in the project area. For all of the action alternatives, the majority of harvest units would not be visible from Visual Priority Travel Routes Areas. The visible harvest would be prominent for viewers entering upper Saginaw Bay under either Alternative 3 or 5. For Security Bay the most visible change would occur under Alternatives 4 and 5. Forest visitors also would notice one harvest unit when entering upper Rowan Bay under implementation of Alternatives 4 or 5. Under Alternative 2 visitors frequenting Security Bay, Saginaw Bay, or Rowan Bay would not likely notice much change beyond existing conditions. Harvest within the Kadake Creek recreational river corridor would only occur under Alternatives 2 and 4. The visual change under these alternatives would resemble a natural forest setting.

The overall scenic effect of the alternatives would vary in comparison to the visible harvest area as seen from sensitive viewing locations. Alternatives 4 and 5 would create the greatest amount of visible change to the landscape from development of harvest units. Alternative 3 would harvest approximately 50 percent fewer acres than would Alternatives 4 and 5. Alternative 2 would have the least effect harvesting approximately 162 acres potentially visible from priority viewing areas Table 3-84.

3.12.5.1 Effects Common to all Action Alternatives

Utilization of the existing LTFs either at Rowan Bay or Saginaw Bay for log transfer, storage, and camp operations would result in the developed appearance and modification to the scenic environment associated with these types of activities. The LTFs are visible in the foreground distance zone along the shoreline near the head of these bays. For those traveling the inside waters of Rowan Bay or Saginaw Bay the logging operations would not likely be noticed until within ¼ to ½ mile of the locations. The sort yard, area for log storage, and most equipment at the sites would be partially screened from view by foreground vegetation and would meet the Forest Plan visual quality objectives.

Contractors harvesting timber would continue to support their operations with either a land or floating camp. Visibility of these activities would be a distraction from the natural scenic environment but confined to a relatively small area and would be consistent with the VQOs. Camp operations would be required to obtain and follow the necessary permitting requirements associated with these activities.

Some of the effects of temporary road construction, borrow pits, and other ground disturbing activities necessary to implement the Kuiu project would be visible from Visual Priority Travel Routes Areas. However, these effects would be far less visible than timber harvest and would meet the Forest Plan VQOs.

3.12.6 Effects by Alternative

3.12.6.1 Alternative 1

This alternative defers timber harvest in the project area and maintains the existing visual character of the landscape. Previously harvested units within the project area would continue to mature and develop the visual characteristics of a more natural appearing and undeveloped forest.

3.12.6.2 Alternative 2

Alternative 2 proposes harvest of fourteen units utilizing several silvicultural treatments: even-aged management (clearcutting), two-aged management (clearcutting with reserves (CCR) of 50 percent basal area (BA) retention), and uneven-aged management (50 percent BA retention by singe tree selection (STS), and 50 percent BA retention by group selection (GS)). Six of the 14 units are partially visible from Visual Priority Travel Routes Areas. However, all six are not visible from the same location. Portions of Units 103c and 111, which have a Maximum Modification VQO, are in the seen area of upper Security Bay. The harvest would result in approximately 11 acres of clearcut visible in Unit 103c, and the 17 acres of partial harvest (50 percent CCR) visible in Unit 111. The effects would achieve a Partial Retention VQO, and meet a higher degree of scenic quality than required by the Forest Plan. Units 207. 208a, and 208b propose harvest of approximately 46 combined acres that would be visible near the head of Saginaw Bay, resulting in a VQO of maximum modification. The effects of Unit 207 would be lessened by 50 percent BA retention which would achieve a higher VQO of modification. Unit 208a would achieve the partial retention VQO with 16 acres of visible harvest. Unit 208b would result in a Maximum Modification VQO with 51 visible acres.

Unit 415 is located in the Kadake Creek drainage, and partially within a Forest Recreational River classification. Approximately 18 acres of timber would be removed within the seen area of the river corridor using a 50 percent retention CCR method. Additional trees would be retained adjacent to Road 6415 to screen the unit from the road. Visibility of harvest from Kadake Creek itself would not be readily apparent as a result of the steep stream bank configuration and trees bordering the edge of creek. The portion of Unit 415 within the Recreational River corridor would meet the adopted VQO of Partial

Retention. The remainder of Unit 415 located within the Timber Production LUD would achieve a modification to maximum modification VQO.

Alternative 2 proposes harvesting the fewest acres visible from priority viewing locations. The remaining units in this alternative are not visible from any Visual Priority Travel Routes Area and achieve a Maximum Modification or higher degree of scenic quality than adopted under the Forest Plan.

3.12.6.3 Alternative 3

In Alternative 3, Units 109, 204, 205, 207, and 208 are partially visible in the middleground distance zone from the waters of Security Bay or Saginaw Bay. All units in this alternative have a Forest Plan VQO of Maximum Modification. Units 109 would be only slightly noticeable and would meet the Partial Retention VQO. The proposed silvicultural treatment of 50 percent BA retention of CCR for Unit 109 below the temporary road (52 acres), and even-aged management (clearcut) for 48 acres above the temporary road, would affect approximately 21 acres would be partially visible from the head of Security Bay.

Units 204, 205, 207, and 208 are located in the seen area of upper Saginaw Bay. Units 204, 205, and 208 are situated on the east side of the South Fork of Saginaw Creek and are visible on the upper slopes behind the log transfer facility (LTF) from saltwater locations in the mid to upper Saginaw Bay. Units 205 and 208 are proposed for clearcut harvest and Unit 204 is proposed for 50 percent BA retention CCR. Units 205 and 208 would meet the Maximum Modification VQO with approximately 39 and 69 acres of visible harvest respectively. Unit 204 would likely meet the Modification VQO with approximately 69 acres of partial harvest. Unit 207 would not be visible to most people visiting Saginaw Bay as it can only be seen from the extreme upper end of the bay in waters that are usually unnavigable. The harvest treatment for Unit 207 is 57 acres 50 percent retention CCR and 3 acres even-aged management (clearcut), resulting in a Partial Retention to Modification VQO.

The remaining units in this alternative are not visible from any Visual Priority Travel Routes Area and meet a Maximum Modification or higher degree of scenic quality than required by the Forest Plan.

3.12.6.4 Alternative 4

In Alternative 4, Units 101, 109, 111, 401, and 503 could be completely or partially visible in the middleground distance from the waters of Security Bay. Units 207, 208, 302, and 303, could be completely or partially visible in the middleground from Saginaw Bay,

and Unit 412 would be partially visible in the middleground near the head of Rowan Bay. Units 414 and 415 are seen in the foreground distance zone of Kadake Creek.

The most visually dominant harvest unit of this alternative is Unit 101, a clearcut of 98 acres located at the upper end of Security Bay. However, about a third of the unit extends over the ridgeline and would not be in view. Unit 101 would be in high contrast to the surrounding natural landscape and very evident to forest visitors. Units 109, 111, and 401, also visible within Security Bay, are proposed for even-aged management clearcut with 21, 17, and 19 acres of harvest respectively. These units would be considerably less evident in contrast, and meet the VQO modification, a higher degree of scenic quality than required by the Forest Plan.

Units 207, 208, 302, and 303 are located in the seen area of upper Saginaw Bay up the Saginaw Creek drainage. Units 302 and 303 are situated on the west side, and Unit 208 on the east side of the South Fork of Saginaw Creek. Unit 207 would not be visible to most people as it can only be seen from the extreme upper end of the bay in waters that are usually unnavigable. Units 302 and 303 are proposed for 50 percent BA retention STS with approximately 60 acres of visible partial harvest, meeting the Modification VQO. Unit 208 would meet the Maximum Modification VQO with approximately 60 acres of clearcut harvest visible. The harvest treatment for Unit 207 is 50 percent BA retention CCR, meeting a Partial Retention to Modification VQO with approximately 49 acres of partial harvest visible.

The upper half of the 99-acre Unit 412 would become visible to travelers entering Rowan Bay at a point where the bay turns in a northerly direction. The reduced visibility of Unit 412 as a result of screening by foreground vegetation would reduce the contrast somewhat so the unit does not appear as a dominant feature in the landscape. As a result, the unit would meet a Modification to Maximum Modification VQO depending upon the angle and location of view.

Units 414 and 415 would harvest a combined total of 49 acres within the Foreground Viewing Distance of the Kadake Creek Recreational River Corridor. Silvicultural treatment of 50 percent BA retention CCR would meet the VQO of Partial Retention. The remainder of Units 414 and 415 located within the Timber Production LUD would achieve a Modification to Maximum Modification VQO as viewed from within the corridor.

Kuiu Timber Sale

Figure 3-10

Adopted Visual Quality Objectives

Legend

- Retention
- Partial Retention
- Modification
- Maximum Modification
- Non-National Forest
- Recreational River
- Managed Stands
- Unit Pool
- Project Area Boundary
- 500ft Contour Interval
- Stream Value Class I & II
- Existing Open Roads
- Kadake Bay Cabin

Saginaw Bay

Keku Strait

Security Bay

Kadake Bay

Kadake Bay Cabin

6403 46251 46252 6441 6425 6448 46090 46092 6409 504 503 6421 6415 6411 6410 46420 6418 103d 103c 302 303 205 207 204 208b 208a 208 209 112 101 6402 305 6413 307 46096 211 308 210 212 109b 111 401 6401 402 403 405 414 416 415 409 404 410 6414 418 417 6416 46355 46360 412 6436 6437 6438 6404 6407

0 0.5 1 2 3 4 Miles

N

c:\workspaces\kuiu_roadedpacks.mxd\p3_11ex-p.mxd 11-26-05 EP

The remaining units in this alternative are not visible from any Visual Priority Travel Route and Use Area and achieve a Maximum Modification or higher degree of scenic quality than required by the Forest Plan.

3.12.6.5 Alternative 5

All units in Alternative 5 are proposed for even-aged harvest by clearcut. Ten of the units are completely or partially visible from Visual Priority Travel Routes or Use Areas. Units 101, 109, 111, 401, and 503 are within the seen area of Security Bay and identical in effects to Alternative 4. The Modification to Maximum Modification VQOs would be achieved and would meet a slightly higher degree of scenic quality than required by the Forest Plan.

Units 204, 207, 208a, and 208b are located within the seen area of Saginaw Bay, and would meet the VQO of Maximum Modification. Unit 207, located on the backside of a ridge facing Saginaw Bay would not be visible to most people unless approaching the extreme upper end of the bay. The unit would include approximately 49 acres within the seen area. Units 204, 208a, and 208b are located in close proximity on the east side of the South Fork of Saginaw Creek. The combined visible harvest is slightly over 100 acres, with a green tree retention buffer between 208a and 208b, somewhat reducing the overall effects. The three units 204, 208a, and 208b would also meet the VQO of Maximum Modification.

The upper half of 99-acre Unit 412 would become visible to travelers entering Rowan Bay at a point where the bay turns in a northerly direction. The reduced visibility of Unit 412 as a result of screening by foreground vegetation would reduce the contrast somewhat so the unit does not appear as a dominant feature in the landscape. As a result, the unit would meet a VQO of Modification to Maximum Modification depending upon the angle and location of view.

The remaining units in this alternative are not visible from any Visual Priority Travel Route or Use Area and would meet a Maximum Modification or higher degree of scenic quality than required by the Forest Plan.

3.12.7 Cumulative Effects

Cumulative effects consider the overall scenic effects expected as a result of past, present, and foreseeable future development. Previous development in the project area has been extensive, modifying the scenic environment from a natural condition to a condition where landscapes appear highly modified. These effects include timber harvest, roads, borrow pits, associated construction activities, and existing effects of adjacent non-National Forest System lands. The proposed action alternatives for the current project include suitable timber available for harvest. Implementation of any of the proposed

alternatives at the present time would continue to modify the scenic environment. Cumulative effects of future conditions would continually change over time to a greater or lesser extent, and in general ultimately present the appearance of the desired future condition outlined in the Forest Plan.

3.12.7.1 Allowable Visual Disturbance

Allowable Visual Disturbance expresses how much visual disturbance is acceptable for a given area during any given time period. The proposed management activities for the Kuiu Timber Sale Area may occur adjacent to or near previously harvested locations. Even though individual harvest units may meet a particular Visual Quality Objective, cumulatively a greater impact may result.

During the cumulative effects analyses for the Forest Plan, maximum disturbance thresholds were described (Forest Plan FEIS Appendix B, pages B-17 through B-19). It was assumed that up to 50 percent of a viewshed may be under development at any given time for areas within the Timber Production LUD adopting the Maximum Modification Visual Quality Objective. Table 3-89 displays the cumulative visual disturbance by alternative for each VCU in the project area.

Table 3 - 89. Percent cumulative visual disturbance by VCU

	Alt 1 (current condition)	Alt 2	Alt 3	Alt 4	Alt 5
VCU 399 (Saginaw)	19%	21%	22%	23%	22%
VCU 400 (Security)	27%	28%	28%	29%	30%
VCU 402 (Rowan)	26%	28%	29%	29%	34%
VCU 422 (Kadake)	19%	20%	21%	24%	21%

Previously harvested units within the project area that are visible from visual priority travel routes or use areas currently range from 19 to 27 percent of the "seen area." This quantity is well within the maximum disturbance threshold of 50 percent allowed under the Forest Plan and represents a higher degree of scenic quality than required for timber production areas. The cumulative effect of the past harvest and the proposed alternatives is still well below the maximum disturbance threshold of 50 percent allowed under the Forest Plan.

3.12.7.2 Visual Recovery

The visual effects of timber harvest are greatest immediately following completion of the project. Within five years, vegetation would begin to grow, transitioning in color from brown to light green. Green tree retention in the harvested areas would reduce the overall contrast of new growth with the surrounding forest. From five to 20 years after tree removal, young trees become established, reaching a height of approximately 15 feet and further reducing the color contrast with adjacent forested areas. After 50 years, the emerging forest would achieve a height of approximately 50 feet. Color contrast at this point is near that of a mature forest and only textural differences are apparent. Edge lines forming the boundary of harvested areas become less apparent, with the appearance further reduced by asymmetrical unit design. At 80 years after harvest stand vegetation achieves 75 percent of its mature height. At 100 years, the stand would reach approximately 100 feet in height and the appearance of the past harvest would no longer be evident.

3.12.7.3 Forest Plan Direction

For the Timber Production LUD, cumulative effects will likely lead to a visual condition where management activities appear highly evident and become a dominant feature in the landscape. Assuming implementation of the Forest Plan through the entire rotation, all timber designated as suitable for timber production within the Kuiu Timber Sale Area would be harvested within the next 100 years. During this period, the forest would be in a continuous state of transition toward meeting the desired future condition of the Timber Production LUD. The landscape would be characterized by regenerating harvested areas of mixed age classes from young stands to trees of maturing height, typically in 40-acre to 100-acre groups. The activities associated with timber harvest will present a highly modified landscape.

3.13 Recreation

3.13.1 Introduction

Kuiu Island is almost bisected by two large bays. Bay of Pillars cuts from east to west and Port Camden cuts from the west toward the east. These two large bays separate the more heavily managed northern portion of the island from the less developed southern portion. The Kuiu Timber Sale Area is in the northern section. There are three bays within or beside the project area boundary: Security Bay, Saginaw Bay, and Kadake Bay. Also, not included in the project boundary but potentially affected by the project is Rowan Bay. There is an existing recreation cabin located in Kadake Bay and a small logging camp and Forest Service administrative facility located in Rowan Bay.

Access to Kuiu Island is by boat or floatplane. There are no landing strips or airports for planes without floats. Both Rowan Bay and Saginaw Bay have LTFs, either of which may be used to transfer logs from the Kuiu Timber Sale Area to saltwater. The LTFs also provide access to the area road system for visitors arriving by boat to hunt or recreate in the area. These visitors may bring ATVs or occasionally vehicles to use on the road system. The road system does not connect to any community or ferry terminal.

Black bear hunting is popular in the area during both the spring and fall seasons. Most of this activity takes place along the shorelines, with a few people using the road system for bear hunting. Many creeks provide sport-fishing opportunities, with Kadake Creek the most popular and most heavily used sport fishing creek in the project area. Kadake Creek provides excellent steelhead, trout, and salmon fishing.

3.13.2 Recreation Opportunity Spectrum (ROS)

To describe, identify, and quantify recreation settings, the Forest Service uses the Recreation Opportunity Spectrum (ROS). The ROS categorizes areas by their activities, remoteness, access, and experiences in a spectrum of classes from Primitive to Urban. The Kuiu Timber Sale Area has three of the seven ROS classes: Roaded Modified, Semi-primitive Motorized, and Semi-primitive Non-motorized (Table 3-90).

3.13.2.1 Roaded Modified

In areas classified as Roaded Modified, substantial modifications of vegetation and landforms typically dominate the landscape. There is moderate evidence of other users on roads and in dispersed areas (generally less than 20 encounters a day). A feeling of independence and freedom exists with little challenge and risk. Recreation users will likely encounter timber management activities. About 84 percent of the Kuiu Timber Sale Area is classified as Roaded Modified.

Table 3 - 90. Existing Recreation Opportunity Spectrum (ROS) Classes within the Kuiu Timber Sale Area*

ROS Class	Acres	Percent
Roaded Modified (RM)	38,837	84%
Semi-primitive Motorized (SPM)	3,913	9%
Semi-primitive Non-motorized (SPNM)	2,996	7%
Total Acres	**45,746**	**100%**

* Does not include 356 acres of non-National Forest System lands in the project area.

3.13.2.2 Semi-primitive Motorized

Semi-primitive Motorized areas are natural or natural-appearing environments generally greater than 2,500 acres in size. They are generally located within ½ mile of primitive roads, but not less than ½ mile from more developed roads and other motorized travel routes. Concentration of users is low (generally less than ten group encounters per day), but there is often evidence of other users. There is a moderate probability of experiencing solitude, closeness to nature, and tranquility along with a high degree of self-reliance, challenge, and risk in using motorized equipment. Local roads may be present, and there may be extensive boat traffic along saltwater shorelines. Approximately nine percent of the project area is in the Semi-primitive Motorized class. This area is found along the shoreline on the eastern shore of Security Bay and around to the north and the northwestern shore of Saginaw Bay.

3.13.2.3 Semi-primitive Non-motorized

Semi-primitive Non-motorized areas are natural or natural-appearing environments generally greater that 2,500 acres in size and generally located at least ½ mile but less than three miles from all roads and other motorized travel routes. Concentration of users is low (generally less than ten group encounters per day), but there is often evidence of other users. There is a high probability of experiencing solitude, freedom, closeness to nature, tranquility, self-reliance, challenge, and risk. No roads are present in the area. Within the project area the Semi-primitive Non-motorized area (seven percent) is an interior area southeast of Saginaw Bay. It is away from existing harvest units and

roads and relatively isolated from the sights and sounds of human activities. Much of this area is within the small Old-growth Habitat Reserve (OGR) in VCU 399.

3.13.3 Recreation Places and Sites

Since the majority of the Tongass National Forest is undeveloped, it is primarily used for dispersed recreation activities. Viewing scenery and wildlife, boating, fishing, beachcombing, hiking and hunting are the primary dispersed recreation activities that take place.

In theory, the entire National Forest has the potential of providing recreation opportunities. However, due to terrain considerations (very steep, inaccessible areas), user preferences, and presence of certain amenities (scenery, good fishing), some areas are more highly valued. These highly valued areas are termed recreation places.

Recreation places are specific areas identified by the Forest Plan that are used for recreation activities. They are geographical areas having one or more physical characteristics that are particularly attractive to people for recreation activities. The ROS setting of a Recreation Place largely determines its attractiveness and utility. The Forest Plan direction for recreation places in the Modified Landscape and Scenic Viewshed LUDs is to maintain the existing ROS setting. The Forest Plan direction in the Timber Production LUD is to seek to minimize impacts to recreation places through scheduling and location of project activities. When approved activities nearby may result in a change to the ROS setting, the impacts should be minimized so that a Roaded Natural or other more natural ROS setting is maintained.

A recreation site is a specific site and/or facility occurring within a recreation place. Recreation sites generally refer to specific points like anchorages or developed facilities such as recreation cabins and trailheads.

The selection and identification of recreation places and sites was done by noting what characteristics or qualities of a site attract and influence visitor use. A knowledge of these key sites aids in the future evaluation of potential effects within the broader ROS concepts. The following discussion describes, by VCU, the recreation use and attractors in each general area. Within these areas there may be one or more recreation places.

3.13.3.1 Saginaw Bay – VCU 399

Much of the bay's eastern shoreline provides opportunities for rock hounding, fossil collecting, and the study of Native culture. Of special interest is Halleck Harbor. A gently-sloping sand beach and protected anchorage attract numerous boaters. A log transfer site on the south side of the bay provides access to the road system on Kuiu Island. Waterfowl hunting occurs at the head of the bay, and fishing in

Saginaw Creek. There are three recreation places within this VCU: the head of Saginaw Bay, Halleck Harbor, and the Cool/Ledge Lake area. There is also a special use permit for a waterline for a float house in Saginaw Bay. Saginaw Bay itself is outside the project area, but one alternative proposes a Log Transfer Facility (LTF) in the bay, which could affect recreation in the area.

The limestone bedrock adjacent to Saginaw Bay and the Keku Islets has been identified as having a high potential for cave formations similar to those found on Prince of Wales Island. Opportunities exist for future trail development to Cool and Ledge lakes, allowing easier access for stream and lake fishing. Most of the activities in this VCU provide semi-primitive motorized experiences.

3.13.3.2 Security Bay – VCU 400

Recreational use is generally water-oriented. There are two recreation places in this area which include the head of the bay and the shoreline around the bay. Secure anchorages exist at numerous points along the bay's shoreline. Excellent waterfowl and black bear hunting occur at the head of the bay. The State of Alaska has designated some of the large islands, and parts of the eastern shoreline in the northeast corner of the bay, as a State Marine Park. The intent of the 1,324-acre State Marine Park is to protect marine and dispersed recreation, waterfowl/shorebird concentrations, anchorages, and community harvest. The State has no plans at this time to develop facilities at the Marine Park. While Security Bay is outside the project area, it is being analyzed because of its proximity to the project area.

3.13.3.3 Rowan Bay – VCU 402

A Log Transfer Facility (LTF) exists on the north shore of Rowan Bay. An adjacent dock provides access to the internal road system for boaters and floatplane passengers. A large area that supported a major logging camp and sort yard is located in the vicinity. There are two recreation places in this VCU, which include the estuary at the head of Rowan Bay, and the anchorage on the south shoreline. Hunting and sport fishing occurs in the estuary. Boaters frequently anchor in a small cove on the south shoreline near the bay's mouth. Rowan Bay is outside the project area boundary, but three alternatives propose using the Log Transfer Facility (LTF) in Rowan Bay, so it is being analyzed from a recreation perspective.

3.13.3.4 Kadake Bay – VCU 421

Excellent steelhead, trout, and salmon fishing is possible in the waters of Kadake Creek. Bear and waterfowl hunting occur throughout the bay. Much of the use is associated with an existing recreation cabin located in the bay at the mouth of Kadake Creek. Kadake Bay and the cabin are outside the project boundary. Boats can anchor near the bay

entrance or at Gil Harbor, which also contains an excellent salmon fishery. An opportunity exists to construct a trail from Forest Road 6415 to the headwaters of Kadake Creek, providing better fishing access. The three recreation places in this VCU include Kadake Bay, a portion of Kadake Creek, and Gil Harbor. All three are outside the project area boundary, but because of their proximity to the area, and their important recreation values, they are included in this analysis.

3.13.4 Outfitters and Guides

Several outfitter/guides do business on Kuiu Island including the north end where the project area is located. The two main categories for outfitter/guides are sightseeing and black bear hunting. North Kuiu Island supports one of the densest black bear populations in Southeast Alaska (Lowell 2004). It consequently draws many hunters from out-of-state and also a number of Alaskan hunters. According to the Alaska Department of Fish and Game (ADF&G), approximately 80 percent of those who hunt black bear on Kuiu Island are nonresidents. This means Alaskan businesses derive substantial financial benefits from hunter-related expenditures on transportation, lodging, groceries, equipment, and supplies (Lowell 2004).

Each year since 2000, up to seven outfitter/guides have held Special Use Permits on northern Kuiu Island. These businesses are generally based out of boats and hunt the shorelines and estuaries. Three outfitter/guides have had permits for the Kuiu Island road system and use ATVs or vehicles to hunt farther inland. These businesses depend on the consistent population level of black bear on northern Kuiu Island. Any decrease in population would decrease income, and could possibly put outfitter/guides out of business if populations dropped low enough.

The number of outfitter/guide user days allowed for northern Kuiu Island was adjusted with the 2004 review of the *1997 Stikine Area Outfitter and Guide Environmental Assessment* (USDA FS 1997(e), 2004(a), 2004(b)). Some areas were reassessed and added to the home range of Kake, so the level of outfitter/guide use allowed in those areas decreased from 25 percent of the total recreation carrying capacity to 10 percent of the carrying capacity. The review changed the capacity calculations for eight recreation places on north Kuiu Island to reflect the Kake home range. Outfitter/guide capacities are determined by study area as delineated in the *Outfitter and Guide Environmental Assessment.* North Kuiu is comprised of three study areas (12A, 12B, and 14) which all overlap the Kuiu Timber Sale. The recent outfitter/guide use in these three study areas is still well below the allocated capacity. Area 12A (Rowan Bay and Washington Bay) was at 50 percent capacity in 2004; Area 12B (Saginaw Bay) was at 17

percent capacity in 2004 (35 percent peak in 2001); and Area 14 (Security Bay and Kadake Bay) was at 23 percent capacity in 2004 (27 percent peak in 2000).

Sightseeing on north Kuiu Island includes small cruise ships and tour boats, as well as private boats and yachts. These boats often visit the unique fossil bluffs and limestone cliff areas in Halleck Harbor and Saginaw Bay. If the clients go ashore for hiking or fishing on National Forest Land, the operators are required to get a Special Use Permit for that use. There are several outfitter/guides that use Saginaw Bay for those activities.

3.13.5 Potential Recreation Opportunities

As recreation use increases on Kuiu Island, some opportunities exist to enhance the recreation experience. During this analysis and in previous scoping efforts, projects have been suggested by the public and Forest Service personnel for the Kuiu Timber Sale Area and vicinity. The project ideas listed below are not being analyzed in detail at this time. They may be considered in the future if public use of the road system increases enough to warrant more recreation opportunities. Past outfitter/guide use has included some fishing and sightseeing along the road system.

- Construct a trail access from Road 6425 to Cool and Ledge lakes to enhance fishing opportunities.
- Construct a trail from Road 6415 to Kadake Creek to increase fishing access. This would allow access by foot from the road to the lower creek area, which is currently accessed by foot from Kadake Bay.

3.13.6 Environmental Consequences

3.13.6.1 Direct and Indirect Effects to the ROS

The Kuiu Timber Sale Area has already been modified heavily by past timber harvest and road building. New harvest units in the same area would not substantially change the recreation settings or experiences on north Kuiu Island. Very minor changes would occur to the ROS in any of the proposed alternatives. Less than one percent of the acres would change from a Semi-primitive Non-motorized setting to a Roaded Modified setting in Alternatives 3, 4, and 5. No change would occur in Alternatives 1 and 2 (Table 3-91).

Table 3 - 91. Recreation Opportunity Spectrum (ROS) class acres in the Kuiu Timber Sale Area

ROS Class	Alt. 1 Acres	Alt. 2 Acres	Alt. 3 Acres	Alt. 4 Acres	Alt. 5 Acres
Roaded Modified (RM)	38,837	38,837	38,858 (+21)	38,900 (+63)	38,900 (+63)
Semi-primitive Motorized (SPM)	3,913	3,913	3,913	3,913	3,913
Semi-primitive Non-motorized (SPNM)	2,996	2,996	2,975 (-21)	2,933 (-63)	2,933 (-63)
Total Acres	**45,746**	**45,746**	**45,746**	**45,746**	**45,746**

* Does not include 356 acres of non-National Forest lands within the project area.

3.13.6.2 Direct and Indirect Effects to Recreation Places

Effects to recreation places can range from proposed timber harvest or road building within a recreation place, to changes in the scenery as viewed from a recreation place. None of the alternatives propose timber harvest or road building within any recreation places. The effects to scenery are described in detail in the Scenery section. Other effects to the recreation places (mostly temporary) are:

- **Saginaw Bay** – a Log Transfer Facility (LTF) in Saginaw Bay may be used with the action alternatives. If this facility is selected for log transport it would temporarily change the recreation experience with increased boat traffic in the bay as well as log barge traffic. The increased noise and activity at the LTF itself would also add to the feeling of more development and less remoteness in the recreation experience. Increased activity and log barge traffic in Saginaw Bay would be noticeable to the many sightseers who visit Saginaw Bay on private yachts, small tour boats and medium-size cruise ships. This effect would be short-term, lasting only as long as the timber was actually being harvested. Additional visible effects to the landscape as seen from Saginaw Bay are described in the Scenery section. All alternatives would have some visible units from Saginaw Bay, but Alternatives 4 and 5 would have the most visible units (see Scenery section this chapter).

- **Security Bay** – Users in the recreation places in Security Bay may hear the sounds of logging as it is taking place. Alternatives 4 and 5 would have the greatest effects with the proposed harvest of Units 101, 503, and 504. This temporary effect would end after logging was complete. As described in the Scenery section, long-term effects to scenery may also affect users in Saginaw Bay.
- **Rowan Bay** – The existing LTF in Rowan Bay may be selected for log transfer. This LTF would require no reconstruction. The increased boat traffic and log barge traffic within the bay would be noticeable to recreationists at the recreation place in the head of Rowan Bay and the anchorage on the south shore. The increased noise and activity at the LTF itself would also add to the feeling of more development and less remoteness in the recreation experience. These effects would be temporary, and last only as long as the timber sale was being actively logged. Additional effects to scenery from the harvest of Unit 412 (in Alternatives 4 and 5) are described in the Scenery section of this chapter. These effects would be reduced somewhat with foreground vegetation screening.
- **Kadake Bay and Kadake Creek** – Kadake Bay is far enough away from any proposed units to not be subject to the sounds of logging. The Kadake Creek recreation place, however, is much closer to proposed units, and is adjacent to Road 6415 at one end. Users in the western part of the Kadake Creek recreation place could hear the sounds of logging and hear log truck traffic. This part of Kadake Creek is within a Roaded Modified setting, so expectations for a remote experience are not as high as in Kadake Bay where the setting is Semi-primitive Motorized.

3.13.6.3 Direct and Indirect Effects to the Kuiu Road System

There would be few direct effects to roads and access from the proposed harvest activities. There would be no classified roads constructed, but between 2.9 and 19 miles of temporary road would be constructed, depending on the alternative. All new temporary roads would be closed after timber harvest is complete. Between 8.4 and 11 miles of classified open road is proposed for closure, depending on the alternative. Some of the proposed road closures could affect some users if they expect to drive those roads. For more information about road management objectives for the project area, refer to the Transportation section of this chapter and the Road Cards in Appendix B.

3.13.6.4 Direct and Indirect Effects to Outfitters and Guides

Bear Hunting – One of the major recreation activities on north Kuiu Island is black bear hunting. Black bear densities are not expected to

change due to timber harvest or road densities from this project (see Issue 2- Wildlife and Subsistence section this chapter). A short-term effect may occur if logging activities occur during the black bear hunting season. The logging activities including increased traffic may disrupt bear activities along roads. However, State hunting records show that only approximately six percent of bears harvested on Kuiu were along roads and any disruption would be small and seasonal.

Sightseeing – Outfitter/guides who take clients sightseeing along the Kuiu shoreline and into the bays would notice increased timber harvest. The amount of proposed landscape change varies by alternative. Timber harvest is not a new element to the landscapes of Kuiu Island. Additional harvest could displace some outfitter/guides, but more likely, the attractions of the shorelines, including limestone cliffs, would keep most sightseers coming to Kuiu Island.

Fishing – Most outfitter/guides who take clients freshwater fishing on north Kuiu would probably continue to do so with any of the proposed alternatives. The main attraction is the fishing, especially in Kadake Creek. The scenery changes in an already modified landscape would not be great enough to keep people away.

3.13.7 Effects by Alternative

3.13.7.1 Effects Common to all Action Alternatives

During timber harvest, log truck traffic and other traffic associated with the timber sale would increase and could negatively affect the few recreationists along the road system. This would include the two outfitter/guides that currently use the road system. The use of the LTF site at either Rowan Bay or Saginaw Bay would affect recreationists in those areas. These effects were outlined previously where effects to Recreation Places were discussed for Saginaw Bay and Rowan Bay.

For all action alternatives, the longest length of road proposed for closure is Road 46096 (4.1 miles), which has road cracks and slumps and minor non-catastrophic failures. It is expected to be undrivable in about five years. Current use of the roads is very low. Two black bear hunting outfitter/guides are currently permitted to use the Kuiu road system.

3.13.7.2 Alternative 1

This alternative proposes no new timber harvest or road building on Kuiu Island. The recreation on the island would remain as it is with no changes to existing ROS. The existing recreation places and sites would also remain unchanged with this alternative. New timber harvest or road building would not affect outfitter/guide use.

3.13.7.3 Alternative 2

This alternative proposes the least amount of timber harvest and road building of the action alternatives. There would be no change to the

existing ROS classes since all of the areas proposed for harvest are already in a Roaded Modified setting. No existing recreation places would be harvested but a few places could be affected by the proximity of harvest activity.

Alternative 2 proposes to close 8.2 miles of road that are now open by removing drainage structures and putting in water bars. About half of these roads are already overgrown with alder and undrivable or growing closed and would be undrivable within five years. These roads would still be accessible by foot.

3.13.7.4 Alternative 3

This alternative proposes the second lowest amount of timber harvest and road building. There would be very little change to the existing ROS classes since only 21 acres would change from Semi-primitive Non-motorized to Roaded Modified. This change amounts to less than one percent change. None of the proposed harvest units or temporary roads would actually fall within the existing semi-primitive area, but the location of Unit 210 would change the conditions and experiences in a small part of the semi-primitive area.

Alternative 3 proposes to close 8.4 miles of road that are now open by removing drainage structures and putting in water bars. About half of these roads are already overgrown with alder and undrivable or growing closed and would be undrivable within five years. These roads would still be accessible by foot. The longest length of road proposed for closure is Road 46096 (4.1 miles), which has road cracks and slumps and minor non-catastrophic failures. It is expected to be undrivable in about five years. Current use of the roads is very low.

3.13.7.5 Alternative 4

This alternative proposes the second highest volume of timber harvest and proposes the most miles of temporary road construction. Although 63 acres would change from Semi-primitive Non-motorized to Roaded Modified, this still reflects less than one percent change from the existing condition. In addition to unit 210 proposed in Alternative 3, Alternative 4 proposes Units 211 and 212 near the existing semi-primitive area. About a quarter acre of Unit 212 would actually fall in the existing semi-primitive area. This overlap and the proximity of Units 210 and 211 account for the change in recreation setting that would occur.

Alternative 4 proposes to close 11 miles of road that are now open by removing drainage structures and putting in water bars. Some of these roads are already overgrown with alder and undrivable or growing closed and would be undrivable within five years. These roads would still be accessible by foot.

3.13.7.6 Alternative 5

This alternative proposes the highest volume of timber harvest, but would harvest fewer acres than Alternative 4 because all of the proposed harvest in Alternative 5 would be clearcut. The effect to ROS classes would be the same as Alternative 4 since Alternative 5 also proposes harvest of Units 210, 211, and 212.

Alternative 5 proposes to close 11 miles of road that are now open by removing drainage structures and putting in water bars. Some of these roads are already overgrown with alder and undrivable or they are growing closed and would be undrivable within five years. These roads would still be accessible by foot.

3.13.8 Cumulative Effects

The project area is within a larger area on north Kuiu Island that has been heavily harvested in the past. The proposed timber harvest is within the Timber Production LUD in the Forest Plan, and is in an area with an expectation for harvest. The proposed activities for this project would not significantly change the existing recreation opportunities. The nature of the current recreation opportunities would remain the same.

One of the major recreation activities on north Kuiu Island is black bear hunting. The effects of continued logging on black bear are not well understood. Changes in habitat and road densities may affect black bear numbers within the areas of activity. Reductions in black bear population within the roaded portion of Kuiu Island may affect the outfitter/guides and local Alaskans who hunt from the roads in those areas.

Recreation settings on north Kuiu Island have changed drastically since timber harvest activities began in the 1960s. The area now has numerous roads and timber in various age classes. It is an area where people expect to see timber harvest. New harvest would add to the developed feel of the area, but would not be a significant change from its current condition.

3.14 Socioeconomics

3.14.1 Introduction

About 70,600 people live in towns, communities, and villages located on islands and coastal lands of Southeast Alaska. The southeast region accounts for about eleven percent of the State's population and six percent of the land base, with an average density of two persons for every square mile. Federal lands comprise about 95 percent of Southeast Alaska, 80 percent within the Tongass National Forest. Southeast communities are within or adjacent to the Tongass and are largely dependent on the Forest to provide natural resources for commercial fishing, timber harvest, recreation, tourism, mining, and subsistence.

River and stream systems on the Tongass contribute to a healthy salmon fishery for commercial and sport fishing. About one third of the timber harvested in Southeast Alaska is from the Tongass. Federal policy requires that timber harvested from the Tongass be processed within Southeast Alaska, supporting wood products jobs and income throughout the region. Rural residents participate in subsistence hunting, fishing, and gathering as part of their livelihood and to continue cultural and historic ways of life. Throughout the Forest, the residents of southeast and visitors to the region participate in recreational and tourism activities. The resources of the Tongass National Forest offer a certain quality of life that many southeast residents have come to appreciate.

3.14.2 Community Profiles

3.14.2.1 Social and Economic Setting

Kake, Point Baker, Port Protection, Petersburg, and Wrangell are the communities nearest the project area and are most likely to be affected socially and economically by the project in terms of subsistence, recreation, tourism, and general local use of the area. The potential impact to nearby communities with processing facilities that may use the timber would depend on many elements associated with the competitiveness and efficiency of individual operations. Such factors are dependent upon private business decisions as well as market conditions for forest products. The Forest Service cannot predict which firms will successfully bid for a timber sale. Therefore, potential community benefits relating to jobs and incomes associated with a sale will not be predicted specifically, but in a regional summary.

3.14.2.2 Population and Ethnicity

Kake is on Kupreanof Island and is the nearest community to the project area. Kake is historically an Alaska Native town occupied traditionally by the Kake Tlingit who controlled trade routes around Kuiu and Kupreanof islands. In 1891, a government school and store were built followed by a post office in 1904 and a cannery in 1912.

Kake's population continues to be comprised mostly of Alaska Natives whose lifestyle revolves around fishing, logging, and other subsistence activities.

Point Baker and Port Protection are located on northwest Prince of Wales Island. They are about three miles apart and are accessible to one another by boat. According to a 2004 state demographer estimate, 24 people live in Point Baker and 47 in Port Protection. There is a school in Port Protection. The first store was built in 1941, and a post office opened in 1942. The first floating fish packer came to Point Baker in 1919, and fish buying continued until the 1930s when the Forest Service opened the area for home sites. In Port Protection, "Wooden Wheel" Johnson became the first resident in the early 1900s. His store, fuel dock and fish-buying scow enabled trollers to stop for supplies and safe anchor on their trips north and south.

Both communities rely on commercial fishing as their main industry and there is at least one charter business. Residents use Kuiu Island for subsistence and recreation activities.

Petersburg was settled by Norwegians in the late 1890s. Archaeological evidence indicates that Native Alaskans lived in and around the area for at least two thousand years prior to European settlement. The Norwegian founders developed a fishing and fish packing industry that influenced a steady population increase until the 1960s. Other groups, including Native Alaskans and Asians, were present in town from the early years. After Statehood, large-scale fishing, timber and transportation industries influenced population growth and diversity.

Wrangell was originally a Tlingit village influenced by the Russian establishment of a fur-trading network beginning around 1811. Later influences include the Hudson's Bay Company and the establishment of a U.S. military post in 1868. A sawmill and canneries continued to boost population until the 1990s. Today the population is mostly white with about a quarter of the population being Alaska Native.

Table 3-92 presents population estimates for local communities and displays a recent trend towards population decline.

Table 3 - 92. Population estimates for local communities

	1990	2000	2004
Kake	700	710	663
Petersburg	3,207	3,224	3,123
Point Baker and Port Protection	101	98	71
Wrangell	2,479	2,308	2,023

Source: Alaska Department of Commerce, Division of Community and Economic Development 2004 State Demographer's estimate, ADCED website, available at: http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.htm

3.14.2.3 Employment and Income

In **Kake** the City, School District, and Kake Tribal Corporation are the largest employers. Fishing, seafood processing, and logging contribute considerably to the economy. Sixty-seven residents hold commercial fishing permits. The non-profit Gunnuk Creek Hatchery has assisted in sustaining the salmon fishery. Kake Foods produces smoked and dried salmon and halibut. Turn Mountain Timber, a joint venture between Whitestone Logging and Kake Tribal Corporation, employs residents in logging tribal corporation lands. Southeast Stevedoring, a Sealaska contractor, also provides employment at the log sort yard and transfer facility at Point Macartney. Subsistence resources including salmon, halibut, shellfish, seaweed, deer, bear, waterfowl and berries supplement income. Kake is currently pursuing tourism income and opportunities.

The **Petersburg** economy has been based on commercial fishing and timber industries. The city is one of the top-ranking ports in the U.S. for the quality and value of fish landed, with 473 residents holding commercial fishing permits. Several processors operate cold storage, canneries, and custom packing services. Petersburg remains, to a lesser degree, a supply and service center for logging camps, independent sportsmen, and tourists. There is no deep-water port to accommodate large cruise ships. Smaller cruise ships stop overnight in Petersburg with an agenda focused on eco-tourism and the Norwegian culture.

Wrangell's economy is based on commercial fishing and timber. Fishing and fish processing are an important segment of the economy, with approximately 250 residents holding commercial fishing permits. The closure of the Alaska Pulp Corporation sawmill in 1994 saw a steady decline in the timber industry related economy. The mill was later sold to Silver Bay Logging and reopened in April 1998 with 33 employees. The mill is currently operating, though the timber sector is

not considered stable at the present time. Wrangell offers a deep-water port that caters to the mid-sized cruise ships, and cruise ship related tourism activities have increased.

3.14.3 Social Issues

Social concerns for the Tongass National Forest and Southeast Alaska are raised locally, nationally and even globally. Southeast Alaska is a unique and special place to people who live there, to those who visit, and to those who enjoy wilderness and remote landscapes. Communities within the Tongass National Forest depend upon, and can be directly or indirectly impacted by management of the Tongass forest resources. Community impacts can be both negative and positive, depending on the needs of individual communities. For a complete discussion and description of social issues, refer to the Forest Plan FEIS, Part 2.

Local social issues associated with this project include employment and passive use values. These issues have been discussed and analyzed in other sections of this EIS, and in other resource reports. National issues are not directly addressed since these larger issues were considered in the context of the Resource Protection Assessment (RPA), Forest Plan and other policies. While social issues are often difficult to quantify and compare, they are no less important to the management of the national forest and the balance of resource uses and users.

3.14.3.1 Employment

The economy of Southeast Alaska has been changing significantly over the last several decades. Currently the region is adjusting to changes in the wood products industry and an increase in tourism. Both pulp mills and several of the larger sawmill operations have closed down in recent years, and timber harvesting from the Tongass has steadily declined during the same period. Reviews of regional employment and income data indicate that while manufacturing has declined, retail and service have steadily increased. While this accounts for continued growth in terms of employment, the wages associated with service and retail jobs have not made up for the loss of higher manufacturing wages. For a complete discussion concerning the economic trends of Southeast Alaska, refer to the Forest Plan, Final EIS, Part 2 and the Economic and Social Environment section of Chapter 3 in the Forest Plan Final SEIS (2003).

3.14.3.2 Passive Use

Passive use values include the values people place on an area or resource that is not associated with actually using, visiting, extracting, or even viewing the resource they value. There are two components of passive use value, existence value and bequest value. Existence value is the value of benefit someone receives from knowing a place or resource exists - without intentions of ever using the resource or

visiting the place. Bequest value is the value or benefit someone receives from knowing a place or resource will be available for use, active or passive, by others in the future. These values tend to be associated with longer time frames and are impacted by changes to the resource that are also long term, like road building, timber harvesting, mining or other development.

All of the action alternatives would affect the passive use values as expressed in the public comments. Those alternatives with less timber harvest and less road construction would maintain passive use values associated with unroaded areas, and intact landscapes, and current habitat. Alternatives with higher harvest levels and more road construction would decrease these passive use values.

3.14.4 Distribution Analysis

Distribution analysis concerns the equity with which resources are distributed. It is the balancing of local, regional, and national wants, needs, and values. By identifying local impacts and being aware of national values, decision makers can balance the benefits and costs among geographical, political, social, ethnic, and economic sectors of society. In this project area analysis, the distribution of impacts is considered from two perspectives: (1) impacts of employment and income by occupation, and (2) environmental justice.

3.14.4.1 Employment and Income by Occupation

Selecting any action alternative would change the area, possibly the activities that occur, and the magnitude of the values associated with the area. The measurable values directly related to the action alternatives include the employment and income associated with timber harvest. In general, a stable timber industry would benefit the local economies of Kake, Petersburg and Wrangell mainly through support businesses like grocery and fuel. Depending on sale size and bid awards, small local timber operators might also benefit. Southeast Alaska as a functional economic region would be affected through increases in employment opportunities. There is some outfitter/guide use in and around the project area. This use is described in the Recreation section of this chapter. New road access might prove beneficial for outfitter and guide activities as well as subsistence users. However, the new access would be short term since the new roads would be closed after harvest. Outfitter and guide employment opportunities would not likely be affected by implementation of any of the action alternatives.

3.14.4.2 Environmental Justice and Civil Rights

As required by law Executive Order 12898, all federal actions will consider potentially disproportionate effects on minority or low-income communities. Where possible, measures should be taken to avoid impact to these communities or mitigate the adverse effects. Potential impacts or changes to low-income or minority communities in the project area due to the proposed action were considered.

Kake, though not in the project area, is nearby and has a long history of local use. Kake's population is about 75 percent Native and has been considered in the analysis of the proposed alternatives for disproportional impacts. The Organized Village of Kake was consulted and encouraged to comment at any point in the process to ensure their concerns would be addressed. Several public meetings were held in Kake to assist people in understanding the alternatives and how issues were addressed. These meetings also gave the public opportunities to highlight other issues or concerns they had. The Heritage Resource Report in the project planning record discusses the cultural environment of the area and addresses the Forest Service responsibilities according to historic preservation laws and regulations. There are no known historic properties (cultural resources) within the area of potential effect. Native traditional values were considered, particularly those associated with subsistence use of the project area. Native populations should not be disproportionately impacted under any alternative.

3.14.5 Effects to Economic Activity

The proposed action alternatives would affect the social and economic values of the project area. In general quantitative terms, timber purchasers may hire locally and provide income to local support businesses, namely grocery, hardware, and fuel. The alternatives that offer more timber could provide proportionally more economic stimulus. Wrangell could benefit economically from the action alternatives should the logs end up at the local mill. Petersburg and Kake could benefit from proposed action alternatives through use of support services.

3.14.5.1 Outfitter / Guide and Recreation Use

Guided and unguided recreation and tourism occurs across the project area. Outfitter and guide study area data indicate activities that include black bear and wolf hunting, fishing, sightseeing, hiking, and camping (Recreation Resource Report Appendix B located in the project planning record). The existing road system has been used for some of these activities. Since 1996, one to two outfitter and guides have been issued yearly special use permits to use the Kuiu Island road system

for bear hunting, fishing, and sightseeing. These two outfitter and guides are permitted to use the road system for up to 77 activities a year and. In 2004, their combined total was 51 hunts.

Unguided recreation also occurs in the project area. Saginaw Bay and Rowan Bay provide good anchorages and access to the existing road system. During the summer months recreation vessels and commercial fishing boats frequent the bays. Upland use occurs but is not formally documented. Visitors also bring ATVs to Kuiu and use the road system often.

Impacts to recreation and sport activities during logging may prove negative due to increased traffic and possible noise disturbance. Also, the planned closure of currently open roads would limit access in the long term. New temporary road access might prove beneficial for outfitter and guide activities and subsistence users. Access would be short term since all new roads would be closed after harvest. Recreation activities occurring in Saginaw Bay and Security Bay during logging may be affected by noise disturbance. If the Saginaw Bay LTF were used, people in Saginaw Bay would be affected by barge activities.

3.14.5.2 Commercial Fishing

Local economies are largely based on commercial fishing and fish processing. Fishermen use some of the waters around the project area but are not specifically dependent on this area. Riparian standards and guidelines, Best Management Practices and estuary and beach fringe protection were developed and initiated to protect salmon populations regardless of the alternative selected. Effects to the fish populations and anadromous fish habitat would not likely be noticeable. These effects are discussed in Issue 4- Cumulative Effects on Watersheds and Essential Fish Habitat sections of this EIS.

3.14.5.3 Tourism, Recreation, Heritage Resources and Scenery

Tourism is a significant industry that continues to grow throughout Southeast Alaska and relies on several different resource bases. Some tourism activities depend upon the wildness of Alaska in attracting and engaging visitors to participate in outdoor adventures. Other tourism activities cater to visitors who enjoy the scenery of Alaska while being provided the comforts associated with development. Currently, the waters around the Kuiu Timber Sale Area support some tourism activities in the form of outfitter and guides. Fishing, black bear hunting, and wildlife viewing are the main activities. Costs and revenues associated with commercial tourism in the project area have not been estimated for each alternative, but would not likely vary by alternative. The analysis of changes in recreation is discussed in the Recreation section of this chapter.

The project area is visible from public travel routes and use areas and the scenery is subject to change as a result of the proposed activities. Change results from timber removal, road construction, rock quarry development, and use of marine access facilities.

Impacts to the scenery are likely to negatively impact tourism. In general, the alternatives that harvest the least amount of timber have the least affect on scenery. See the Scenery section of this chapter for detailed information regarding scenic impacts.

3.14.5.4 Payments to States

In October 2000, the Secure Rural Schools and Community Self Determination Act of 2000 (commonly referred to as "Payments to States" legislation) was enacted to stabilize federal payments to states in response to declining federal receipts. Prior to 2000, in states with national forests, 25 percent of the returns to the US Treasury from revenue-producing Forest Service activities such as timber sales, were returned to each state for distribution back to counties (or in Alaska, boroughs) having acreage within a national forest. Those payments were called the 25 percent fund payments and were dedicated by law to roads and schools.

Under the new legislation for fiscal years 2001 through 2006, affected Alaska boroughs and communities have elected to receive a full payment amount rather than 25 percent of receipts. The full payment amount is the average of the highest three payments made to the state during the 14 year period between 1986 and 1999. These annual full payment amounts are primarily dedicated to roads and schools, with provisions for special project funding under certain conditions. Under the full payment approach, Forest Service payments to the State of Alaska from 2001 to 2006 period would not be linked to annual Forest Service revenue, rather they would be based on the high three year historic average. The difference in revenues among the alternatives considered in this EIS would therefore have no effect on the payments Alaska boroughs and communities receive during the 2001 through 2006 period. Allocation of special project funding is decided through Resource Advisory Committees (RACs). Potential projects encompass a broad range of maintenance and improvement work for such items as roads and trails, watersheds, and fisheries and wildlife habitat on national forests or non-federal land where the project would benefit resources on federal land.

3.14.6 Effects of the Alternatives

3.14.6.1 Direct and Indirect Effects

Economic Efficiency

Economic efficiency compares the costs and benefits of resources, whether or not they can be quantified. It is another tool used in the decision-making process to gain full information, both quantitative and qualitative, about a project and differences among alternatives.

An economic efficiency analysis highlights non-quantifiable values. It includes national and global values, carbon sequestration, clean water, inspiration and beauty, and local values such as scenery, quality of life, community, and sense of place. Many of these benefits and costs are not valued through the market or exchange of money and can be difficult to quantify or summarize. Often, the same effect may be considered a cost to some and a benefit to others, depending on individual values. There is a difference between potential impacts directly associated with sale activity that would be short-lived (3-5 years) and impacts of harvesting that would be long term (50 or more years).

Alternative 1, the no-action alternative, would maintain the current level of opportunities for resource use. Those people interested in maintaining unroaded areas, primitive recreation opportunities, current levels of roaded access, and scenery would experience the same conditions in the project area in the near future as they do now. Those interested in using or expanding roaded recreation and access or increasing wood product resource uses would also have the same opportunities in the near future as they do now. All action alternatives would cause changes to the current situation. These changes are described as increases or decreases in opportunities, benefits, or costs.

Many of the benefits and costs are short-term, lasting only as long as a proposed timber sale would be active. Wood products employment associated with the sale, temporary road development, noise, logging camp use, log transfer facility activity, and increased traffic are examples of short-term impacts. Landscape changes are effects that would remain after timber harvest is complete. The time frame of individual impacts should be considered when evaluating the impacts of each alternative and when looking at cumulative effects.

3.14.6.2 Cumulative Effects

Most socioeconomic issues are not quantifiable because they rely on individual perceptions and values. Details regarding timber economics are discussed in the timber economics resource report. In general, a stable timber industry would benefit the local economy mainly through support businesses like grocery and fuel. Because Wrangell currently has an operable mill, the community could see substantial economic

gain if the timber industry regains stability. Depending on sale size and bid awards, small local timber operators might also benefit. Conversely the selection of the no-action alternative could result in a loss of opportunities for the local operators. The no action alternative would preserve passive values including habitat preservation for posterity or local use.

Declining population trends in Southeast Alaska affect some aspects of social economics. New timber-related business opportunities stimulated by industry stability might help offset socioeconomic factors relating to population decline. Recreation-based business opportunities are less likely to be affected by population trends since visitor arrivals in Alaska grow every year, providing both new and support-related opportunities. Recreation use in the project area is well below the recommended carrying capacity and proposed activities would not pose a significant change to current use.

Selection of any of the alternatives, regardless of the action, would not likely affect the major local economic base, commercial fishing.

3.15 Heritage Resources

3.15.1 Introduction

Heritage resources include an array of historic and prehistoric cultural sites and traditional cultural properties. The National Historic Preservation Act (NHPA) sets forth Government policy and procedures regarding these "historic properties" -- that is, districts, sites, buildings, structures and objects included in or eligible for the National Register of Historic Places. Section 106 of the NHPA requires that Federal agencies consider the effects of their actions on such properties, following regulations issued by the Advisory Council on Historic Preservation (36 CFR 800).

The Section 106 review process seeks to consider historic preservation concerns with the needs of federal actions. Review occurs through consultation with the Alaska State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation (ACHP), Federally recognized Tribal Governments, and other parties with an interest in the effects of the undertaking on historic properties, commencing at the early stages of project planning. One of the goals of consultation is to identify historic properties that potentially may be affected by the undertaking, assess potential effects and seek ways to avoid, minimize, or mitigate any adverse effects on historic properties. The Forest Service consulted with the Organized Village of Kake (OVK), the tribal group that is culturally affiliated with the project area.

To ensure that the procedural requirements of 36 CFR 800 were met, a cultural resource investigation of the Kuiu Timber Sale Area was also conducted. In accordance with the Programmatic Agreement (2002) among the Forest Service Alaska Region, the ACHP, and the SHPO, the resource report was submitted under modified 36 CFR 800 regulations implementing Section 106 of the National Historic Preservation Act. The cultural resource survey did not result in the identification of any new sites and no known historic properties would be affected by project activities. The Organized Village of Kake, the Petersburg Indian Association, Sealaska Corporation, and the Tlingit-Haida Central Council were provided copies of the Forest Service Heritage Resource Report for review and comment.

3.15.2 Affected Environment

According to oral tradition and various ethnographic accounts, the Tlingit are the dominant native group of Southeast Alaska. The Kuiu Timber Sale Area lies within the traditional territory of the Kake Tlingit, who occupied the north half of Kuiu Island and the western portion of Kupreanof Island, with some occupation along the mainland shore of Frederick Sound as well as parts of Baranof Island and Prince of Wales Island. Prehistoric archaeological site types common to the region include villages, seasonal camps, gardens, rock art sites, and

both wood and stone fish traps and weirs. The earliest known archaeological site in Southeast Alaska is on Prince of Wales Island, where investigations suggest people have been living in the region for close to 10,000 years.

Trapping, fur farming, fishing, timber harvest, mineral exploration, and homesteading are some of the historic endeavors that have drawn people to Southeast Alaska and helped shape it into what it is today. Many of these activities are represented in the archaeological record in the form of historic period cabins, mines, fur farms, canneries, salteries, and culturally modified trees (CMTs).

3.15.2.1 Area of Potential Effect

The project's Area of Potential Effect (APE) is the geographic area where timber harvest and road construction may cause changes in the character or use of historic properties, if any such properties exist [36 CFR 800.2(c)]. The APE is defined early in the planning process before identification of historic properties actually begins so it may not be known whether any historic properties exist within it. The APE includes all areas where the undertaking may cause changes to land or structures, or to their uses, whether the changes would be direct or indirect, beneficial or adverse. A combination of landscape features, project area boundaries, and areas where timber harvest and road building are proposed were used to help define the APE boundaries (Figure 3-11).

3.15.2.2 Known and Reported Cultural Resources

Previous archaeological investigations have provided insight into some of the early human activity on Kuiu Island. Many village sites, prehistoric fish traps and weirs, midden sites, burials, pictographs, petroglyphs, rock shelters, fort sites, historic trappers' cabins, CMTs, and evidence of beach logging illustrate the wide array of cultural activity that has taken place on Kuiu Island. A review of the Heritage Program site files and atlases reveals 16 sites that were previously recorded within the Kuiu Timber Sale Area all of which are on the coastal terrain of Saginaw Bay or Security Bay and not within the APE. No activities associated with the planned project have the potential to impact these sites.

Kuiu Timber Sale

Figure 3-11
Area of Potential Effect for
Heritage Resources

Legend

- Area of Potential Effect
- Non-National Forest
- Managed Stands
- Lakes/Saltwater
- Unit Pool
- Project Area Boundary
- 500ft Contour Interval
- Stream Value Class I & II
- Existing Open Roads

Saginaw Bay
Keku Strait
Security Bay
Kadake Bay

6403 46251 46252 6441 6425 504 503 6427 6448 46090 46092 6409 6414 6410 46420 6411 6415 103d 103c 6418 302 303 205 207 204 112 208b 6402 101 305 6413 208a 208 209 46096 211 307 308 210 212 109b 111 6401 401 402 403 405 414 416 409 404 415 418 417 410 6416 412 6436 46355 46360 6437 6428 6404 6407

0 0.5 1 2 3 4 Miles

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3.15.3 Environmental Consequences

3.15.3.1 Direct and Indirect Effects

Cultural resource surveys identified no new sites and no known historic properties would be affected with project implementation. None of the proposed action alternatives would have a direct or indirect effect upon known sites in the project area and no sites are located in the APE. All of the nearby archaeological sites and culturally modified trees are within a protected buffer established along the beach and estuary fringe defined in the Forest Plan standards and guidelines (Forest Plan p. 4-4). All of the planned timber harvest units and proposed roads are inland and on relatively steep terrain, within the low probability zone for cultural resources. The use of existing LTFs at Rowan Bay and Saginaw Bay would not affect any known archaeological sites.

3.15.3.2 Cumulative Effects

Current use of the project area centers on timber harvest, hunting, and recreation. Logging occurs inland while most of the recreation activities take place along the beach. Some of the existing logging roads allow inland hunter access as well. Over the years these activities have had little known effect on historic properties. This trend will likely continue unless new use trends develop. Future expanded use of the beach and estuary fringe could eventually affect historic properties, but would not be a result of any of the project alternatives.

3.16 Non-National Forest System Lands and Uses

Approximately 45,746 of the land within the Kuiu Timber Sale Area is National Forest System land. There are two acres of private lands, seven acres of BLM lands, and 347 acres of State of Alaska land within the project area boundary. There would be no effects to other land owners as a result of this project.

There is one water line permit issued for water use from National Forest lands within the project area.

Up to seven outfitter/guides currently have, or have had permits to operate in or near the project area. The possible effects on these activities as a result of this project are discussed in the Recreation, Scenery, and Socioeconomics sections of this chapter. Effects on other uses such as wildlife viewing and hunting are discussed in Issue 2: Wildlife Habitat and Subsistence Use and Issue 4: Cumulative Effects on Watersheds sections of this chapter. A float house in Saginaw Bay has a special use permit for a waterline.

3.17 Findings and Disclosures

3.17.1 National Forest Management Act

3.17.1.1 Tongass National Forest Land and Resource Management Plan

All project alternatives fully comply with the Tongass Land and Resource Management Plan (1997, as amended). This project incorporates all applicable Forest Plan Forest-wide standards and guidelines and management area prescriptions as they apply to the Kuiu Timber Sale Area, and complies with Forest Plan goals and objectives. All required interagency review and coordination has been accomplished.

3.17.1.2 R10 Supplement 2400-2002-1

The Kuiu project fully complies with Alaska Region Supplement 2400-2002-1 to Forest Service Manual 2400. This supplement became effective on May 7, 2002, replacing the Alaska Regional Guide, which was withdrawn on April 16, 2002. Specifically, the Supplement provides direction for the management standards and guidelines for: appropriate harvest cutting methods; forest type standards; maximum size of created openings (a requirement of the National Forest Management Act, discussed below); dispersal and size variation of tree openings; management intensity; utilization standards; sale administration; project monitoring; and competitive bidding and small business.

The Forest Plan complies with all resource integration and management requirements of 36 CFR 219 (219.14 through 219.27). Application of Forest Plan direction for analysis of the Kuiu Timber Sale Area ensures compliance at the project level.

3.17.1.3 Even-aged management as the Optimal Method of Harvesting

The Forest Plan gives guidance on when to use even-aged management. Clearcutting (an even-aged harvest method) is used in this project to preclude or minimize mistletoe infestation, yellow-cedar decline, logging damage or other factors affecting forest health. Specific information for use of this prescription is shown in the silvicultural prescriptions, which are filed in the project planning record. Where used, this prescription has been deemed optimal related to site-specific considerations as described above.

The National Forest Management Act limits the size of even-aged management harvested openings that may be created based on the forest type. For the coastal Alaska western hemlock/Sitka spruce forest type, the maximum created even-aged management opening size

allowed is 100 acres. No proposed even-aged management harvest units in the Kuiu Timber Sale Area will result in openings greater than 100 acres. During layout of the unit if changes are made to the boundary a change analysis must be done. The change analysis includes mapping and documenting the actual layout and rational for those changes. No change that may lead to units with even-aged opening sizes over 100 acres would be approved.

3.17.2 (Roads Rule)

3.17.2.1 Forest Service Transportation; Final Administrative Policy

The Tongass National Forest has prepared the Kuiu Timber Sale Draft EIS to be consistent with the Forest Service Transportation; Final Administrative Policy (Roads Rule).

3.17.3 Endangered Species Act

None of the action alternatives is anticipated to have a direct, indirect, or cumulative effect on any threatened or endangered species in the Kuiu Timber Sale Area or elsewhere. The National Marine Fisheries Service and the U.S. Fish and Wildlife Service have been consulted. No terrestrial threatened or endangered species are known to occur within the Kuiu Timber Sale Area. A Biological Evaluation is included in the project planning record.

3.17.4 Bald Eagle Protection Act

Management activities are restricted within 330 feet of an eagle nest site by a Memorandum of Understanding (MOU) between the Forest Service and the U.S. Fish and Wildlife Service. None of the action alternatives is anticipated to have a significant direct, indirect, or cumulative effect on any bald eagle habitat. If any nests are found that may be affected, the MOU and Forest Plan Standards and Guidelines will be followed.

3.17.5 Tongass Timber Reform Act

Harvest units were designed and located to maintain a minimum 100-foot buffer zone for all Class I streams and Class II streams that flow directly into Class I streams as required in Section 103 of the TTRA. As discussed in Appendix B, the actual widths of these buffer strips will often be greater than the 100-foot minimum. The design and implementation direction incorporates Best Management Practices (BMPs) for the protection of all stream classes. If an action alternative is selected, the timber from this proposed project would provide part of the timber supply to the Tongass National Forest's program to seek to meet market demand.

3.17.6 National Historic Preservation Act

Heritage resource surveys of various intensities have been conducted in the Kuiu Timber Sale Area, following inventory protocols approved by the Alaska State Historic Preservation Officer. These surveys include background and existing literature searches and fieldwork complete with subsurface testing. Native communities have been contacted, and public comment encouraged. During analysis for this project, the Organized Village of Kake, the tribal group culturally

affiliated with the project area, was consulted regarding known or suspected heritage resources in or near the project area. The State Historic Preservation Officer has been consulted and concurred with our finding that no known historic properties are in the area of potential effects.

3.17.7 Federal Cave Resource Protection Act of 1988

Forest Plan Karst and Caves Standards and Guidelines are applied to areas known or suspected to contain karst resources. Within the project area there are 6,624 acres of carbonate bedrock and 2,270 acres of karst. No proposed timber harvest, road construction, or quarry development will occur on these areas or along the drainages which flow to them. Therefore the action alternatives are not expected to affect any significant karst resources.

3.17.8 Alaska National Interest Lands Conservation Act (ANILCA)

A subsistence evaluation was conducted for the alternatives considered in detail, in accordance with ANILCA Section 810. The evaluations in the Subsistence section of this chapter on abundance and/or distribution, access and competition for harvested resources in the Kuiu Timber Sale Area indicate that there will not be a significant possibility of a significant restriction to the customary and traditional subsistence uses of wildlife, fish and shellfish, marine mammals, other foods, or timber resources as a result of this project. However, the Forest Plan addressed the long-term consequences on subsistence and concluded that there may be a significant restriction to subsistence use of deer in the future due to the combined potential effects of projects implementing the Forest Plan and the predicted human population growth on the abundance and distribution of deer and on competition for deer. A subsistence hearing will be held in Petersburg and Kake, Alaska during the 45-day public comment period for the EIS. The results of this hearing will be reported in the FEIS for this project.

3.17.9 Magnuson-Stevens Fishery Conservation Act of 1996

The Magnuson-Stevens Fishery Conservation Act (1996) requires that all federal agencies consult with NMFS when any project "may adversely affect" essential fish habitat. The Forest Service's position is that harvesting timber near Class I streams and wetlands, and the use of the Rowan Bay or Saginaw Bay LTFs may have an adverse affect on Essential Fish Habitat. However, by following the standards and guidelines in the Forest Plan and implementing the Best Management Practices (BMPs), the effects on EFH will be minimized.

According to the agreement between the National Marine Fisheries Service and the USDA Forest Service dated August 25, 2000, this EIS includes the following:

- A description of the proposed action
- An analysis of individual and cumulative effects of the proposed action on the essential fish habitat, the managed species, and associated species such as major prey species, including affected life histories

- The Forest Service's views regarding effects on essential fish habitat
- A discussion of proposed mitigation, if applicable

A copy of this EIS, which includes the specified assessment in this chapter, will be sent to the National Marine Fisheries Service for review.

3.17.10 Clean Water Act

Congress intended the Clean Water Act of 1972 (Public Law 92-500) as amended in 1977 (Public Law 95-217) and 1987 (Public Law 100-4) to protect and improve the quality of water resources and maintain their beneficial uses. Section 313 of the Clean Water Act and Executive Order 12088 of January 23, 1987 address Federal agency compliance and consistency with water pollution control mandates. Agencies must be consistent with requirements that apply to "any governmental entity" or private person ompliance is to be in line with "all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution."

The Clean Water Act (Sections 208 and 319) recognized the need for control strategies for nonpoint source pollution. The National Nonpoint Source Policy (December 12, 1984), the Forest Service Nonpoint Strategy (January 29, 1985), and the USDA Nonpoint Source Water Quality Policy (December 5, 1986) provide a protection and improvement emphasis for soil and water resources and water-related beneficial uses. Soil and water conservation practices (BMPs) were recognized as the primary control mechanisms for nonpoint source pollution on National Forest System lands. The Environmental Protection Agency supports this perspective in their guidance, "Nonpoint Source Controls and Water Quality Standards" (August 19, 1987).

The Forest Service must apply Best Management Practices that are consistent with the Alaska Forest Resources and Practices Regulations to achieve Alaska Water Quality Standards. The site-specific application of BMPs, with a monitoring and feedback mechanism, is the approved strategy for controlling nonpoint source pollution as defined by Alaska's Nonpoint Source Pollution Control Strategy (October 2000). In 1997, the State approved the BMPs in the Forest Service's Soil and Water Conservation Handbook (FSH 2509.22, October 1996) as consistent with the Alaska Forest Resources and Practices Regulations. This Handbook is incorporated into the Tongass Land and Resource Management Plan.

A discharge of dredge or fill material from normal silviculture activities such as harvesting for the production of forest products is exempt from Section 404 permitting requirements in waters of the

United States, including wetlands (404(f)(1)(A)). Forest roads qualify for this exemption only if they are constructed and maintained in accordance with Best Management Practices to assure that flow and circulation patterns and chemical and biological characteristics of the waters are not impaired (404)(f)(1)(E). The BMPs that must be followed are specified in 33 CFR 323.4(a). These specific BMPs have been incorporated into the Forest Service's Soil and Water Conservation Handbook under BMP 12.5.

The design of harvest units and proposed roads for this project are in accordance with standards and guidelines, and direction contained in the Forest Plan, Best Management Practices and applicable Forest Service manual and handbook direction. The Unit Cards in Appendix B contain specific practices prescribed to prevent or reduce non-point sediment sources. Monitoring and evaluation of the implementation and effectiveness of Forest Plan standards and guidelines and Best Management Practices will occur. Project activities are expected to meet all applicable State Water Quality Standards.

All roads, landings, and rock pits for this project will be constructed in accordance with Best Management Practices listed in 33 CFR 323.4(a). Site specific BMPs will be listed on the Unit Cards in Appendix B. All roads, landings and rock pits will be designed to minimum standards to accommodate timber harvesting and silvicultural activities.

3.17.11 Clean Air Act

Emissions expected from implementation of any of the action alternatives would be of short duration and are not expected to exceed State of Alaska Ambient Air Quality Standards (Alaska Administrative Code, Title 18, Chapter 50).

3.17.12 Coastal Zone Management Act and the Alaska Coastal Zone Management Program (ACMP)

The Coastal Zone Management Act of 1972 (CZMA), while specifically excluding federal lands from the coastal zone, requires that a federal agency's activities be consistent with the enforceable standards of a state's coastal management program to the maximum extent feasible when the agency's activities affect the coastal zone. The State of Alaska developed the Alaska Coastal Management Plan (ACMP) in 1977 to evaluate any projects within the coastal zone.

The enforceable standards for timber harvest activities are found in the Alaska Forest Resource and Practices Act of 1993. The standards and guidelines for timber management activities in the Kuiu Timber Sale Area meet or exceed the standards in the State Forest Resources and Practices Act.

A Memorandum of Understanding specifies ACMP review procedures between the Forest Service and the State of Alaska. The State agencies involved are the Department of Fish and Game, the Department of Natural Resources, and the Department of Environmental

Conservation. This memorandum serves to describe the process and expedite the review of whether a proposed project is consistent with the Alaska Coastal Management Program.

The Forest Service developed the Proposed Action and alternatives to the Proposed Action to be consistent, to the maximum extent feasible, with the enforceable policies of approved State management programs. The Forest Service has determined that all the alternatives for the Kuiu Timber Sale Area are consistent, to the maximum extent feasible, with the Alaska Coastal Management Program, as outlined in the Memorandum of Understanding. A review will be coordinated through the Alaska Department of Natural Resources, Office of Project Management and Permitting to determine if the State agencies agree with the Forest Service's determination.

3.17.13 Executive Order 11593

Executive Order 11593 directs federal agencies to provide leadership in preserving, restoring and maintaining the historic and cultural environment of the Nation. The work accomplished in accordance with Section 106 of the National Historic Preservation Act for the Kuiu Timber Sale Area meets the intent of this Executive Order.

3.17.14 Executive Order 11988

Executive Order 11988 directs federal agencies to take action to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains. A floodplain is defined as the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands, including at a minimum that area subject to a one percent or greater chance of flooding in any given year.

Forest Plan standards and guidelines for riparian areas exclude most commercial timber harvesting from floodplains. Roads may be constructed in or through floodplains subject to the design requirements of Best Management Practices. Effects on floodplains from project activities have been avoided or minimized as much as possible.

3.17.15 Executive Order 11990

Executive Order 11990 requires federal agencies to avoid, to the extent possible, the long-term and short-term adverse impacts associated with the destruction or modification of wetlands.

This project avoids impacting wetlands whenever practicable, but it is not feasible to avoid all wetland areas. Effects will be minimized by avoiding the use of wetlands as sites for overburden disposal, avoiding temporary road construction through wetlands whenever practicable, and by decommissioning new temporary roads after timber harvest. Implementation of BMPs, minimizing ditching, and providing adequate cross drainage will also help minimize the amount of wetlands affected.

In certain instances, crossing a wetland area can reduce the overall environmental impacts of a particular road because it facilitates avoidance of steep slopes and alignment of roads perpendicular to stream crossings. The Kuiu Timber Sale Area action alternatives propose up to 2.8 miles of temporary road construction across wetlands.

To reduce any road impacts to the hydrology at these sites, frequent road cross-drains would be constructed. To avoid artificial interception of water by roads, free-draining, coarse-textured rock would be used in road foundations, and installation of an adequate size and number of culverts would be required. Drainage structures would be removed on all temporary roads.

3.17.16 Executive Order 12898

Executive Order 12898 directs federal agencies to identify and address the issue of environmental justice, which concerns adverse human health and environmental effects of agency programs that disproportionately impact minority and low-income populations.

Subsistence use of resources by area residents does not vary significantly by ethnicity. No known subsistence food or material from the project area is used primarily by minorities.

Public scoping and open houses were available to residents of Petersburg and Kake; and advertised through the local media, newspaper, TV scanner, local radio stations, and posted flyers at grocery stores and other businesses. See the Public Involvement section in Chapter 1.

Implementation of the action alternatives for the Kuiu Timber Sale Area will not cause adverse health, social, or environmental effects that disproportionately impact minority and low-income populations. See also the ANILCA Section 810 findings.

3.17.17 Executive Order 12962

Executive Order 12962 directs Federal agencies to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide. Section 1 of the Executive Order is most pertinent to the Kuiu Timber Sale Area. Section 1 directs Federal agencies to evaluate effects on aquatic ecosystems and recreational fisheries, develop and encourage partnerships, promote restoration, provide access, and promote awareness of opportunities for recreational fishery resources.

The effects of this project on freshwater and marine resources were evaluated during the analysis. With the application of Forest Plan standards and guidelines, including those for riparian areas, no significant adverse effects to freshwater or marine resources are expected to occur.

Partnerships continue to be used to leverage federal project funds to address water quality concerns in areas of the Tongass National Forest, although none have been proposed for recreational fisheries in conjunction with this project.

3.17.18 Executive Order 13007

Executive Order 13007 directs federal agencies to accommodate access to and ceremonial use of American Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites. There are no known sacred Indian sites in the Kuiu Timber Sale Area. Consultation with local federally recognized tribes, including the Organized Village of Kake, Petersburg Indian Association, Tlingit/Haida Central Council, and SeaAlaska Corporation occurred during the analysis of this project.

3.17.19 Executive Order 13186

Executive Order 13186 directs federal agencies to evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern. The sections on Wildlife and Threatened and Endangered Species in this chapter provide information on anticipated effects to selected bird species in the project area. None of the proposed activities are expected to have a measurable negative effect on migratory bird populations, although individuals or small groups and their nests may be affected.

Chapter 4
References and Lists

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Glossary

Adfluvial fish
Species or populations of fish that do not go to sea, but live in lakes, and enter streams to spawn.

Alaska Heritage Resource Survey (AHRS)
The official list of cultural resources in the State of Alaska, maintained by the Office of History and Archaeology, Alaska Division of Parks and Outdoor Recreation.

Alaska National Interest Lands Conservation Act (ANILCA)
The Alaska National Interest Lands Conservation Act of December 2, 1980. Public Law 96-487, 96th Congress, 94 Stat. 2371-2551. Passed by Congress in 1980, this legislation designated 14 National Forest wilderness areas in Southeast Alaska. Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

All-terrain Vehicle (ATV)
A motorized four-wheeled vehicle less than 40 inches wide that is restricted by law from operating on public roads for general motor vehicle traffic.

Allowable Sale Quantity (ASQ)
The maximum quantity of timber that may be sold each decade from suitable lands on the Tongass National Forest as identified from the Forest Plan. A ceiling, not a requirement.

Alluvial Fan
A fan-shaped landform comprised of alluvium deposited at the mouth of a steep valley, canyon, or ravine.

Alluvium
Mineral material such as boulders, cobbles, gravel, sand, silt and clay transported or deposited by flowing water.

Alpine/subalpine habitat
Terrain located at elevations too high to support tree growth, such as on mountain peaks or ridges, generally above 1,500 feet in elevation in southeast Alaska.

Anadromous Fish
Fish (such as salmon and steelhead) that spend part of their lives in fresh water and part of their lives in salt water. Anadromous fish ascend from the sea to spawn in freshwater streams.

Aquifer
A unit of rock or gravel that stores and transmits enough water to be hydrologically significant.

Background
The distant part of a viewed landscape, located from three or five miles to infinity from the viewer.

Bark lechates
Soluble organic compounds released into water from bark. Lechates cause the water to have a yellow to brown color.

Basal Area
Total cross-sectional area of a tree or a stand of trees. This is measured at breast height and can be expressed in either square feet per acre or square meters per hectare.

Beach Fringe
The area, typically forested, that is inland from saltwater shorelines.

Best Management Practices (BMPs)
Practices specified in the Soil and Water Conservation Handbook (FSH 2509.22), and used during the planning, design, and implementation of timber sale projects, for the protection of water quality from non-point source pollution in accordance with the Clean Water Act.

Biogeographic Provinces
Twenty-one ecological subdivisions of Southeast Alaska that are identified by generally distinct ecological, physiogeographic, and biogeographic features. Plant and animal species composition, climate, and geology within each province are generally more similar within than among adjacent provinces. Historical events (such as glaciers and uplifting) are important to the nature of the province and to the barriers that distinguish each province.

Biodiversity
The variability among living organisms, including the variability within and between species, and within and between ecosystems.

Biological Assessment
A "biological evaluation" conducted for major Federal construction projects requiring an environmental impact statement, in accordance with legal requirements under section 7 of the Endangered Species Act (16 U.S.C. 1536(c)). The purpose of the assessment and resulting document is to determine whether the proposed action is likely to affect a species that has been listed or proposed as an endangered or threatened species.

Biological Evaluation

A documented Forest Service review of Forest Service programs or activities in sufficient detail to determine how an action or proposed action may affect any species that has been listed or proposed as threatened, endangered, or sensitive.

Biological Opinion

An official report by the Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS) issued in response to a formal Forest Service request for consultation or conference. It states whether an action is likely to result in jeopardy to a species or adverse modification of its critical habitat.

Board foot

A unit of timber measurement equaling the amount of wood contained in an unfinished board one inch thick, 12 inches long, and 12 inches wide.

Buffer

An area of undisturbed or lightly disturbed forest reserved to isolate activity areas from sensitive areas.

Carrying Capacity

The estimated maximum number of individuals within a wildlife species that can be sustained over the long term within a specified area. Carrying capacity is often used interchangeably with the term habitat capability.

Channel Type

A means of defining stream sections based on landform relief, geology, and channel characteristics such as width, gradient, and incision. For descriptions, see "Channel Type Field Guide," Forest Service publication R10-MB-6.

Classified Road

A road wholly or partially within or adjacent to National Forest System lands that is determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service (36 CFR 212.1).

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, strip, or stand large enough to be mapped or recorded as a separate age class in planning.

Climax Plant Community

An assemblage of plants and that is relatively stable over time and which represents the late stages of succession under the current climate and soil conditions.

Coarse Canopy Old-growth forest

Old-growth forest that has lower crown density (number of trees) and non-uniform crown sizes and heights, including large crowns and many canopy

gaps. Coarse canopies are usually found on aspects where the forest is protected from winds that result in catastrophic blowdown events.

Colluvium
Mineral material that is weathered in place or transported as a result of gravity.

Connectivity
A measure of the extent that forest areas between or outside habitat reserves provide wildlife habitat for breeding, feeding, dispersal, and movement.

Cubic Foot
A cube of wood with 1-foot sides. The cubic foot volume is a measure of the total sound wood in a tree and is a more accurate measure of wood volume than board foot.

Culturally Modified Tree (CMT)
Trees that have been altered by human use, usually for the exploitation of bark and wood products.

Cumulative Effects
The 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.

Decommissioning
Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1), (FSM 7703).

Deer Winter Habitat
Locations that provide food and shelter for Sitka Black-tailed deer under moderately severe to severe winter conditions. Usually associated with high volume old-growth stands at low elevation and with south aspects.

Desired Future Condition
A statement of the ultimate goal for resources and uses of an area.

Developed Recreation
Recreation that requires facilities that, in turn, result in concentrated use of an area, such as campgrounds and picnic areas. Facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, and buildings. See also Dispersed Recreation.

Diameter at Breast Height (DBH)
The diameter of a standing tree at a point four feet, six inches from ground level.

Direct Employment
The jobs that are immediately associated with a given activity.

Dispersed Recreation

Recreational activities that are not confined to a specific place and are generally outside developed recreation sites. This includes activities such as scenic driving, hiking, backpacking, hunting, fishing, snowmobiling, cross-country skiing, and recreation in primitive environments. See also Developed Recreation.

Distance Zones

Areas of landscapes visible from priority travel routes and use areas categorized by distance criteria. (Foreground: 0 to ¼- ½ mile, Middleground: ¼ - ½ to 3-5 miles, or Background: greater than 3-5 miles). Used as a frame of reference in which to discuss landscape characteristics and management activities.

Ecological Subsections

Eighty-five terrestrial ecosystems mapped and described for Southeast Alaska and adjoining areas of Canada in Nowacki et al. 2001. These mid-sized terrestrial ecosystems (10-1,000 mi^2) embody similar ecological characteristics (e.g., landforms, streams, vegetation, soils, and wetlands) and provide a practical basis for ecosystem management, planning, and research.

Endangered Species

Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species are identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

Endemic

Peculiar to a particular locality; indigenous.

Estuary

A landform characterized by the presence of, and the mixing of fresh water and salt water at the mouth of a stream, and where salt marshes and intertidal mudflats are present. The landward extent of an estuary is the limit of salt-intolerant vegetation, and the seaward extent is a stream's delta at mean low water.

Even-aged Management

The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.

Fluvial

Of, or pertaining to, streams and rivers.

Forbs

A category of herbaceous plants that are not included in the grass, shrub or tree categories; generally smaller flowering plants.

Foreground
A term used to describe the area immediately adjacent to a viewer, typically located less than ¼ mile in distance.

Forest Plan
Source of management direction for an individual Forest specifying activity and output levels for a period of 10-15 years. Management direction in the plan is based on issues identified at the time of the plan's development.

Forest Land
Land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for non-forest use.

Forest-wide Standards and Guidelines
A set of rules and guidance that directs management activities and establishes the environmental quality, natural renewable and depletable resource requirements, conservation potential, and mitigation measures that apply to several land use designations.

Gap Phase Dynamics
The processes by which the death of one or a few overstory trees acts like a small minor disturbance and permits a small, single-even-aged stand to grow from existing vegetation or seed germination.

Geographic Information System (GIS)
A computerized map database that is used to store and evaluate site-specific information.

Habitat
The sum total of environmental conditions of a specific place that is occupied by an organism, population, or community of plants or animals.

Habitat Capability
Estimated maximum number of fish or wildlife that can be supported by the amount and distribution of suitable habitat in an area. Habitat capability is often used interchangeably with the term carrying capacity.

Habitat Suitability Index (HSI)
A measure of the capability of the habitat to support specific wildlife, based on a variety of environmental factors such as slope, elevation, aspect, and forest type.

Heritage Resources
The prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places. The term includes artifacts, records, and remains that are related to and located within such properties.

High Hazard Soil
Soil that is prone to mass movement. Soil type, geologic bedding, and slope angle are factors considered when establishing which sites are high hazard.

Hydric Soils
Soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.

Hydrologic Recovery
A return to natural conditions of water collection, storage, and discharge.

Indirect Employment
The jobs in service industries that are associated with or support a given activity.

Interdisciplinary Team (IDT)
A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view and a broader range of expertise to bear on the problem or task.

Intermediate Stand Treatment
A stand management treatment that manipulates stand growth, composition, structure, or tree quality. Intermediate treatments include thinning, pruning, release, salvage, and sanitation cutting. These stand treatments do not attempt to obtain new tree regeneration. Some treatments such as salvage cutting or commercial thinning result in the harvest of forest products.

Inventoried Roadless Areas
National Forest System lands identified as undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for inclusion in the National Wilderness Preservation System. These areas are identified by the Roadless Conservation Area Rule.

Irretrievable Commitments
Loss of production or use of renewable natural resources for a period of time. The production or use lost is irretrievable, but not irreversible.

Irreversible Commitments
Decisions causing changes that cannot be reversed. Often applies to nonrenewable resources such as minerals and cultural resources.

Karst
A type of topography that develops in areas underlain by soluble rocks, primarily limestone. Dissolution of the subsurface strata results in areas of well-developed, surface drainage that are sinkholes, collapsed channels, or caves.

Land Use Designation (LUD)
A defined area of land, identified by the Forest Plan, to which specific management direction is applied.

Large Woody Debris (LWD)

Any large piece of relatively stable woody material having a least diameter of greater than 10 centimeters and length greater than one meter than intrudes into the stream channel.

Log Transfer Facility (LTF)

The site and structures which are used for moving logs and timber products from land-based transportation forms to water-based transportation forms.

Low-productive Forest Land

Forested land that does not support enough timber volume to meet the criteria for productive forest land.

Management Indicator Species (MIS)

Vertebrate or invertebrate wildlife species whose response to land management activities can be used to predict the likely response of other species with similar habitat requirements. The National Forest Management Act regulations prescribe the use of management indicator species.

Mass Movement

General term for a variety of processes by which large masses of soil and rock material are moved down slope by gravity either slowly or quickly. Mass movement is often used interchangeably with the term landslide.

Mass Movement Index (MMI)

Rating used to group soil map units that have similar properties with respect to the stability of natural slopes.

Middleground

The visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly from the landscape. The area is located from ¼ mile to 3-5 miles from the viewer.

Mitigation

Measure designed to counteract or reduce environmental impacts. These measures may 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.

Monitoring

A process of collecting information to evaluate whether or not objectives of a project and its mitigation plan are being realized. Monitoring can occur at different levels: to confirm whether mitigation measures were carried out in the matter called for (Implementation Monitoring); to confirm whether mitigation measures were effective (Effectiveness Monitoring); or, to validate whether overall goals and objectives were appropriate (Validation Monitoring).

Multiple Use

The management of all the various renewable surface resources of the National Forest System so that they are used in the combination that will best meet the needs of the American people; harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources.

Muskeg

A bog, often dominated by sphagnum moss, frequently with deep accumulations of organic material, occurring in wet, poorly drained northern regions. Peatland.

National Environmental Policy Act of 1969 (NEPA)

An act declaring it a national policy to encourage productive harmony between humans and their environment and to promote efforts to better understand and prevent damage to ecological systems and natural resources important to the nation. Requires agencies to prepare detailed environmental impact statements for any major federal action significantly affecting the environment.

National Forest Management Act (NFMA)

A law passed in 1976 that amends the Forest and Rangeland Renewable Resources Planning Act, requires the preparation of Forest plans, requires the identification of management indicator species, and defines parameters for timber suitability.

National Forest System Road

A classified forest road under the jurisdiction of the Forest Service. The term "National Forest System road" is synonymous with the term "forest development road" as used in 23 U.S.C. 205.

National Register of Historic Places

A register of historic properties of national, state, or local significance, maintained by the Department of the Interior.

Non-interchangeable Component (NIC)

Non-interchangeable components (NICs) are defined as increments of the suitable land base and their contribution to the allowable sale quantity (ASQ) that are established to meet Forest plan objectives. NICs are identified as parcels of land and the type of timber thereon which are differentiated for the purpose of Forest plan implementation. The total ASQ is derived from the sum of the timber volumes from all NICs. The NICs cannot be substituted for each other in the timber sale program.

Old-growth Forest

Ecosystems distinguished by the later stages of forest stand development that differ significantly from younger forests in structure, ecological function, and species composition. Old-growth forests are characterized by a patchy, multi-layered canopy; trees that represent many age classes; large trees that

dominate the overstory; large standing dead (snags) or decadent trees; and higher accumulations of large down woody material. The structure and function of an old-growth ecosystem will be influenced by its stand size and landscape position and context.

Old-growth Habitat Reserve
A contiguous unit of old-growth forest habitat to be managed to maintain the integrity of the old-growth forest ecosystem.

Interior Old-growth
Old-growth habitat (high, medium, and low volume strata) excluding a distance or buffer of two to three tree lengths (an average of 300 feet) around its inside perimeter.

Open Road Density
The length of classified roads open for public access and use per unit area of land; usually expressed as miles of open road per square mile of land.

Overstory
The portion of trees in a forest that forms the uppermost layer of foliage. Canopy.

Palustrine
Non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity is below 0.50 percent.

Plant Association
Climax forest plant community type representing the endpoint of succession.

Pole Timber
An immature tree between 5 and 9 inches diameter breast height.

Polychaetes
A class of worms.

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.

Practicable
In reference to the Alaska Coastal Management Program, consistent with enforceable policies of approved management programs unless compliance is prohibited based upon the requirements of existing law applicable to the Federal agency's operations.

Process Group
A combination of similar stream channel types based on major differences in landform, gradient, and channel geometry.

Productive Forest Land

Forest land that is capable of producing at least 20 cubic feet of annual tree growth per acre or contains at least 8,000 board feet of net timber volume per acre. This includes second-growth stands that have regenerated with conifer species after natural or human disturbance.

Productive Old-growth

Old-growth stands capable of producing 20 cubic feet per acre per year with 8,000 or more board feet of timber per acre.

Programmed Commercial Timber Harvest

Timber harvest that occurs on suitable forested lands that contributes to the Tongass National Forest Allowable Sale Quantity.

Recreation Opportunity Spectrum (ROS)

A system for planning and managing resources that categorizes recreation opportunities into seven classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skills needed to enjoy the area and the relative density of recreation use.

Recreation Places

Identified geographical areas having one or more physical characteristics that are particularly attractive to people in recreation activities. They may be beaches, streamsides or roadside areas, trail corridors, hunting areas or the immediate area surrounding a lake, cabin site, or campground.

Recreation Sites

A specific site and/or facility occurring within a Recreation Place. Some examples of Recreation Sites are: recreation cabins, trailheads, picnic areas, and wildlife viewing blinds.

Redd

A nest made in gravel, consisting of a depression hydraulically dug by a fish for egg deposition and then refilled with gravel.

Reserve Trees

Merchantable or submerchantable trees and snags that are left within the harvest unit to provide biological habitat components over the rotation.

Resident Fish

Fish that are not anadromous and that reside in fresh water on a permanent basis. Resident fish include cutthroat trout and Dolly Varden char.

Riparian Management Area

The area including land, water, and plants in and adjacent to streams and lakes that is managed according to specific standards and guidelines prescribed for each stream process group.

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.

Rotation
The planned number of years between the time that a forest stand is regenerated and its next cutting at a specified stage of maturity.

Sawtimber
Trees that are suitable in size and quality for the production of dimensional lumber.

Scoping Process
Early and open activities used to determine the scope and significance of a proposed action, what level of analysis is required, what data is needed, and what level of public participation is appropriate. Scoping focuses on the issues surrounding the proposed action and the range of actions, alternatives, and impacts to be considered in an EA or EIS.

Second Growth
Forest growth that has come up naturally or has been planted after disturbance (for example, harvest, serious fire, or insect attack).

Seen Landscape
Those areas visible from the most frequently used travelways (boat route, recreation road, or trail) or use area (recreation cabin or anchorage).

Seldom-seen, or Not-seen, Landscape
Those areas not visible from the most frequently used travelways (boat route, recreation road, or trail) or use area (recreation cabin or anchorage).

Sensitive Species
Animal and plant species identified by the Regional Forester as potentially susceptible or vulnerable to activity impacts or habitat alterations and, therefore, in need of special considerations during land management activity planning.

Shell Midden
A term referring to shell and bone that have been discarded after harvest and processing for subsistence use.

Side-slope Break
The abrupt change (usually decreases) in slope gradient defining the upper limit of stream channel incision.

Silviculture
The theory and practice of managing forest vegetation. Silviculture involves the appropriate application of ecological, social, and economic principles of vegetative management to achieve resource management objectives and desired future forest conditions.

Silvicultural Prescription

Detailed direction about methods, techniques, timing, and monitoring of vegetative treatments. A prescription is prepared by a silviculturist who uses interdisciplinary input to best achieve established objectives, direction, and requirements for land managed by the Forest Service.

Silvicultural System

A management process whereby forests are tended, harvested, and replaced resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the process.

Site Index

A measure of the relative productive capacity of an area for growing wood. Measurement of site index is based on height of the dominant trees in a stand at a given age.

Soil Productivity

Capacity of soil to produce plant growth due to the soil's chemical, physical, and biological properties.

Sortyard

A location used to sort grades, types, and size of logs.

Stand

A group of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition as to be distinguishable from the forest in adjoining areas.

State Selection

Application by Alaska Department of Natural Resources to the Bureau of Land Management for conveyance of a portion of the 400,000-acre State entitlement from vacant and unappropriated National Forest System lands in Alaska under the Alaska Statehood Act.

Stex Volume

Net volume generated for the NEPA Economic Analysis Tool (NEAT) and derived from stand exam plots and the silvicultural prescriptions. Stex volumes are reported in hundred cubic feet (ccf).

Storage

The process/action of closing a road to vehicle traffic and placing it in a condition that requires minimum maintenance to protect the environment and preserve the facility for future use. The maintenance criteria for a road placed in storage includes removing or bypassing all drainage structures to restore natural drainage patterns, adding water bars as needed to control runoff, and revegetating.

Stream Discharge

Flow rate of water in a stream channel.

Stream Value Class

A means to categorize stream channels based on their fish production values. There are four stream classes defined by the Forest Plan. They are:

Class I. Streams and lakes with anadromous or adfluvial fish habitat; or high quality resident fish waters listed in Appendix 68.1, Region 10 Aquatic Habitat Management Handbook (FSH 2609.24), June 1986; or habitat above fish migration barriers known to b easonable enhancement opportunities for anadromous fish.

Class II. Streams and lakes with resident fish populations and generally steep (6-15 percent) gradient (can also include streams from 0-5 percent gradient) where no anadromous fish occur, and otherwise not meeting Class I criteria. These populations have limited fisheries values and generally occur upstream of migration barriers or have other habitat features that preclude anadromous fish use.

Class III. Perennial and intermittent streams with no fish populations but which h e sufficient flow or transport sediment and debris to have an immedi influence on downstream water quality or fish habitat capability. These st ms generally have bankfull widths greater than five feet and are highly incised into the surrounding hillslope.

Class IV. Intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to have an immediate influence on downstream water quality or fish habitat capability. These streams generally are shallowly incised into the surrounding hillslope.

Structural Diversity

The diversity of forest structure, both vertically and horizontally, which provides for variety of forest habitats such as logs and multi-layered forest canopy for plants and animals.

Subspecies

An aggregate of similar pulations of a species nerally inhabiting a geographic subdivision he range of the species and differing taxonomi lly (e.g. different size or color) from other populations of the species.

Subsurface Flow

Water moving laterally through and beneath the soil mantle.

Succession

The ecological progression of plant community change over time, characterized by displacements of species leading to a relatively stable climax community.

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 five years after final harvest,

d) adequate information is available to project responses to timber management activities, and

e) where timber harvest is allowed under the Forest Plan.

Sustained Yield

The amount of renewable resources that can be produced continuously at a given intensity of management.

Temporary Road

Road authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be a part of the forest transportation system and not necessary for long-term resource management (36 CFR 212.1). These roads are to be built to access one or more timber harvest units and decommissioned after use.

Threatened Species

Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of the Interior as a threatened species.

Tiering

Elimination of repetitive discussions of the same issue by incorporating by reference the general discussion in an environmental impact statement of broader scope. For example, this EIS is tiered to the Forest Plan EIS.

Timber Appraisal

Establishing the fair market value of timber by taking the selling value minus manufacturing cost, the cost of getting logs from the stump to the manufacturer, and an allowance for profit and risk.

Tongass Resource Use Cooperative Survey (TRUCS)

A study done to gather information on subsistence uses of the Forest.

Tongass Timber Reform Act (TTRA)

This act (1990) requires annual appropriations for timber management on the Tongass National Forest, with a provision providing for the multiple use and sustained yield of all renewable forest resources.

Transpiration

Evaporation from within the leaves of plants.

Two-aged Management

A silvicultural method designed to maintain and regenerate a stand with two age classes. The resulting stand may be two-aged or trend toward the uneven-aged condition as a consequence of both an extended period of regeneration establishment and retention of reserve trees that may represent one or more age classes. The reserve trees provide structural diversity and a biological legacy. Two-aged management regimes can produce stands of greater structural diversity than even-aged management.

Unclassified Road

A road on National Forest System lands that is not managed as part of the forest transportation system, such as an unplanned road, abandoned travelway, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1).

Understory Vegetation

Grass, small trees, shrubs, and other plants found beneath the overstory (the trees comprising the forest).

Utility Volume

Logs that do not meet minimum requirements for sawtimber but are suitable for other commercial uses.

V-notch

A deeply cut valley along some waterways, generally in steep, mountainous terrain, that would look like a "V" from a frontal view.

Value Comparison Unit (VCU)

A distinct geographic area that generally encompasses a drainage basin containing one or more large stream systems. Boundaries usually follow easily recognizable watershed divides. These units were established in the Forest Plan to provide a common set of areas for which resource inventories could be conducted and resource value interpretations made.

Viable Population

For forest planning purposes a fish or wildlife population which has the estimated number and distribution of reproductive individuals to ensure its continued existence is well distributed in the National Forest.

Viewshed

A distinct area of land visible from identified travelways (boat route, recreation road, or trail) or use areas (recreation cabin or anchorage).

Visual Absorption Capacity (VAC)

An estimate of the relative ability of a landscape to absorb alteration yet retain its visual integrity.

Visual Quality Objective
(VQO) A desired level of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations of the characteristic landscape.

Adopted VQO. The VQO to be achieved as a result of management direction identified in the approved Forest Plan. Adopted VQOs represent the visual resource objective for the planning period, normally 10 years. (FSH 2309.22, R-10 Landscape Management Handbook.)

Volume Class
Term used to describe the average volume of timber per acre in thousands of board feet (MBF).

Volume Strata
Divisions of old-growth timber volume derived from the aerial photo interpreted timber type data (TIMTYP) and the soils data (CLU). Three volume strata (low, medium, and high) are recognized in the Forest Plan.

Watershed
That area that contributes water to a drainage or stream; portion of a forest in which all surface water drains to a common point. Can range from a few tens of acres that drain a single small intermittent stream to many thousands of acres for a stream that drains hundreds of connected intermittent and perennial streams.

Water Yield
The total amount of water draining from a watershed within a year.

Wetlands
Areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include muskegs, marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs.

Wild and Scenic River
Rivers or sections of rivers designated by congressional action under the 1968 Wild and Scenic Rivers Act or by an act of the Legislature of the state or states through which they flow.

Wilderness
Areas designated under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions. In Alaska, wilderness also has been designated by TTRA and ANILCA.

Wildlife Analysis Area (WAA)
A division of land used by the Alaska Department of Fish and Game for wildlife analysis.

Windfirm

Configuration of harvest units so as not to create an opening that exposes the adjacent stand of timber to the direction of the major prevailing storm wind (southeast).

Windthrow (Blowdown)

The process by which trees are uprooted, blown down, or broken off by storm winds. Three types of windthrow include: endemic, where individual trees are blown over; catastrophic; where a major windstorm can destroy hundreds of acres of trees; and management related, where the clearing of trees in an area makes the adjacent standing trees vulnerable to windthrow.

Winter Range

An area, usually at lower elevations, used by big game during the winter months; usually smaller and better defined than summer ranges.

Yarding

Hauling timber from the stump to a collection point.

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List of Preparers

Justin Anderson	Position:	Hydrologist
	Experience:	4 years professional experience (3 years with the Forest Service)
	Education:	BS Forestry Resources Management MS Forest Science/Water Resources Management
Jim Brainard	Position:	Wildlife Biologist
	Experience:	25 years with the Forest Service
	Education:	BS Forest Management
Ben Case	Position:	Forester
	Experience:	11 years with the Forest Service
	Education:	BS Forest Management
Mary Clemens	Position:	Recreation Planner
	Experience:	23 years with the Forest Service
	Education:	BS Forestry
Crystal Harlan	Position:	Fish Biologist
	Experience:	3 years professional experience (2 ½ years with the Forest Service)
	Education:	BS Biology with a Concentration in Marine Science
Bob Moniz	Position:	Timber Appraiser
	Experience:	30 years with the Forest Service
Alan Murph	Position:	Transportation Planner
	Experience:	26 years professional experience (6 years with the Forest Service)
	Education:	BS Civil Engineering
Kent Nicholson	Position:	Forester
	Experience:	20 years professional experience (1 year with the Forest Service)
	Education:	AAS Forestry, Certificate of Forestry, BA Business
Madonna Parks	Position:	Geographic Information Systems Technician
	Experience:	14 years with the Forest Service
R.D. Parks	Position:	Silviculturist
	Experience:	25 years professional experience, 15 years with the Forest Service
	Education:	BS Forestry

Gene Primaky	Position:	Geographic Information Systems Technician
	Experience:	15 years with the Forest Service
	Education:	Certificate of Forestry, AVTC
Kris Rutledge	Position:	Interdisciplinary Planning Team Leader/Writer Editor/ Wildlife Biologist
	Experience:	17 years with the Forest Service
	Education:	BS Wildlife Biology
Linda Slaght	Position:	Writer/Editor
	Experience:	18 years with the Forest Service
	Education:	BA Geology
Jane Smith	Position:	Archaeologist
	Experience:	21 years professional experience (13 years with the Forest Service)
	Education:	BS Anthropology
Jim Steward	Position:	Landscape Architect
	Experience:	20 years with the Forest Service
Kristin Whisennand	Position.	Writer/Editor assistant
	Experience:	3 years of experience
	Education:	BA Anthropology, BS Resource Conservation Management

List of DEIS Recipients

Agencies, organizations, and individuals to whom the Kuiu Timber Sale Area Draft Environmental Impact Statement was sent

Agencies

Admiralty National Monument
Alaska Department of Environmental Conservation
Alaska Department of Fish and Game
Alaska Department of Natural Resources
Alaska State Office HUD
Craig Ranger District - Tongass National Forest
Federal Aviation Administration (USDOT)
Federal Highway Administration (USDOT)
Hoonah Ranger District - Tongass National Forest
Juneau Ranger District - Tongass National Forest
Ketchikan-Misty Ranger District - Tongass National Forest
Ketchikan Supervisors Office – Tongass National Forest
National Marine Fisheries Service (USDOC)
National Marine Fisheries Service, Habitat Conservation
National Park Service (USDI)
NOAA Office of Policy and Strategic Planning
Petersburg Ranger District – Tongass National Forest
Petersburg Supervisors Office - Tongass National Forest
Sitka Ranger District - Tongass National Forest
Sitka Supervisors Office – Tongass National Forest
Thorne Bay Ranger District - Tongass National Forest
US Advisory Council on Historic Preservation
US Army Corps of Engineers
US Coast Guard - Marine Envir. & Prot. Div., G_MEP
US Department of Energy
US Department of Transportation
US EPA - Region 10
US Fish and Wildlife Service - Juneau
US Forest Service, Chugach National Forest
US Navy
USDA APHIS PPD/EAD
USDA Forest Service, Rocky Mountain Research Station
USDA Forest Service, Pacific Northwest Research Station
USDA Forest Service, Alaska Region
USDA Forest Service, Washington Office
USDA Nat. Resources Conservation Svc.
USDI Office of Env. Policy & Compliance
USDI Bureau of Land Management
Wrangell Ranger District - Tongass National Forest

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Tenakee Springs Public Library
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University of Minnesota
University of Nevada Forestry Library
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Media

KFSK Public Radio
Petersburg Pilot

Organizations and Businesses

Adams Alaskan Safari
Alaska Angling
Alaska Center for the Environment
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Alaska Coastal Adventures
Alaska Coastal Hunting
Alaska Coastal Outfitters
Alaska Fibre
Alaska Forest Association
Alaska Island Adventures
Alaska Pacific Trading Company
Alaska Passages
Alaska Rainforest Campaign
Alaska Women in Trees
Alaska Yacht Adventures
American Safari Cruises, Inc.
Anahootz Alaskan Adventure
Anderson & Associates, Inc.
Baranof Expeditions
Baranof Wilderness Lodge
Bluewater Adventures, Ltd.
Cascade Culvert, Inc.
Cascadia Wildlands Project
CEOPA CO-R-E
Coastal Island Adventures
Coastal Wilderness Charters
Earthjustice Legal Defense Fund
Family Partnership, Inc.
Forest Conservation Council
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FSEEE
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Greenpeace USA
Inside Passages
Island Excursions
Island Voyages, Inc
Juneau Group of Sierra Club
Kake Area Conservation Council
Kake Tribal Corporation
Kake Tribal Heritage Foundation
Laughing Raven Lodge
Linblad Expeditions, Inc.
Monographs Acquisition Services
National Outdoor Leadership School
Native Forest Network

Native Subsistence Commission
Natural Resources Defense Council
Northern Land Use Research, Inc.
Paden Timber Services
Patterson River Guide Service
Petersburg Vessel Owners Association
Raven Guide Service
Robertson, Monagle, & Eastaugh
Rocky Pass Resort
Sealaska Corporation
Sierra Club
Silver Bay Logging
Sitka Conservation Society
Sound Sailing, Inc.
Southeast Alaska Conservation Council
Southeast Alaska Wood Products
Southeast Exposure
Southeast Guide Service
Southeast Hunts
Southeast Native Subsistence Commission
The Fishermen's Inn
The Wilderness Society
Tongass Kayak Adventures
Univ. of Alaska Land Mgmt.
Venture Pacific Marine, Inc.
Walt Sheridan & Associates
Washington Wilderness Coalition

Public Officials and Offices

City of Kake
City of Kupreanof
City of Petersburg
City of Point Baker
City of Port Alexander
Ketchikan Gateway Borough
Office of Environmental Policy and Compliance
Office of Project Management and Permitting
Office of the Secretary
Organized Village of Kake
Petersburg Indian Association
Senator Lisa Murkowski
Tlingit/Haida Central Council
Wrangell Cooperative Association
US Senate, Juneau Office
US House of Representatives

Individuals

Manuel Aceveda
David B. Allen
Billy Alsup
Lonnie Anderson
Orlando Bell
Anissa Bery-Frick
Brian Brown
Wilbur Brown, Sr.
Bob & Julie Byers
Paul M. Cadruvi
Dave & Celia Carlson
Chat and Jo Chatham
Emil and Daniel Churchill
Daniel E. Churchill
Mary Ellen Clark
Dick Coose
Nicholas C. Davis
Mr. & Mrs. James L. Denison
Frank Erridge
Gene Feind
Tim Flinchum
Barney Freedman
John Geddie
Fred Goldman
Gretchen Goldstein
Charles Gregory
Kenneth J. Hammons
William Hamner

Russell Hansen
Lloyd Hartshorn
Elinor B. Harvey
Kim Hastings
Don Hernandez
Bill Hollywood
R. Holsinger
Pete Huberth
Raymond and Kani Huffman
Gordon Jackson
Edna Jackson
Joel Jackson
Magnus Jakobsen
Charles Johnson, Jr.
Bonnie and Ryan Johnston
Delbert Kadake
David Kensinger
David King
Bernie C. Klemanek
Rebecca Knight
Steve Kramer
Dan LaCrosse
Erik Lie-Nielsen
Leo Luczak
Stu Mach
Frederick S. Magill
Nancy and Alison Magill
Enid Magill
George Mann
Cynthia and Sigurd Mathisen
Harold Medalen
Tim Miles
Tim Moore
Jackie Moore
Lori Morgan
Don Muller
Richard T. Myren
Ann Marie Parker
Jay & Carolyn Pritchett
Bill Privett
David B. Randrup
Don Sautner
Jeff Schively
Fred J. Shaw
Ronald Simpson
Martha Smith
Richard & Sharon Sprague
Patricia and Seth Stevens
Charley Streuli
John R. Swanson
Patricia Torsen
Emil Tucker
Gary Williams
Edward F. Wood
Larry Young

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Appendix A

Reasons for Scheduling the Environmental Analysis of the Kuiu Timber Sale Area

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Appendix A

Reasons for Scheduling the Environmental Analysis of the Kuiu Timber Sale Project

Introduction

This appendix provides an explanation of the rationale for a specific timber harvest project and its importance to the multi-year timber program on the Tongass National Forest. To accomplish this, the following questions are answered:

- Why is timber from the Tongass National Forest being offered for sale?
- How does the Forest Service develop forecasts about future timber market demand?
- What steps must be completed to prepare a sale for offer?
- How does the Forest Service maintain an orderly and predictable timber sale program?
- How does the Forest Service decide where timber sale projects should be located?

Coordinated timber sale planning is essential for meeting the goals of the Tongass Land and Resource Management Plan and to provide an orderly flow of timber to local industry. To determine the volume of timber to offer each year, the Forest Service can look to current market conditions and the level of industry operations. However, the planning process for timber harvest projects requires the Forest Service to rely on projections of future harvest levels to decide how many timber sale projects to begin each year. This document explains how the Forest Service uses information about future markets and past experience with timber sale planning to determine the volume of timber that needs to be started through this process each year. This appendix relies heavily on the current annual timber demand analysis and the most recent timber sale schedule.

Why is Timber from the Tongass National Forest Being Offered for Sale?

National Legislation

On a national level, the legislative record is clear about the role of the timber program in the multiple-use mandate of the national forests. One of the original objectives for creation of national forests was to provide natural resources, including timber, for the American public. The Organic Act of 1897 (partially repealed in 1976) directed the agency to manage the forests in order to "improve and protect the forest ... [and] for the purpose of securing favorable conditions of water flows, and to *furnish a continuous supply of timber* for the use and necessities of the citizens of the United States" (emphasis added). The Multiple-Use Sustained Yield Act of 1960 directs the Forest Service to administer federal lands for "outdoor recreation, range, timber, watershed, and wildlife and fish purposes."

The National Forest Management Act (NFMA) of 1976 states that "the Secretary of Agriculture...[may sell, at not less than appraised value, trees, portions of trees, or forest products located on National Forest System Lands]." Although the heart of the Act is the land management planning process for national forests, the Act also sets policy direction for timber management and public participation in Forest Service decision-making. Under NFMA, the Forest Service was directed to "limit the sale of timber from each national forest to a quantity equal to or less than a quantity which can be removed from such forest annually in perpetuity on a sustained-yield basis."

The NFMA directs the Forest Service to complete land management plans for all units of the National Forest System. Forest Plans are developed by an interdisciplinary team to provide for the coordination of outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness. Forest plans designate areas of national forest where different management activities and uses are considered appropriate including those areas suitable for timber harvest.

Alaska-Specific Legislation

Timber from the Tongass National Forest is being offered for sale as part of the multiple-use mission of the Forest Service identified in the public laws guiding the agency. In addition, Alaska-specific legislation and the Tongass Forest Plan direct the Forest Service to seek to provide timber to meet market demand, subject to the budget appropriations process.

Legislation unique to Alaska directs the Forest Service to maintain a commercial timber program. The Alaska National Interest Lands Conservation Act (ANILCA) and the Tongass Timber Reform Act (TTRA) provide direction on the issue of Tongass timber supply. Section 101 of TTRA amended the ANILCA timber supply mandate and fixed

budget appropriations and replaced them with the following text in Section 705 (a):

> Sec. 705. (a) Subject to appropriations, other applicable law, and the requirements of the National Forest Management Act of 1976 (P.L. 94-588); except as provided in subsection (d) of this section, the Secretary shall, to the extent consistent with providing for the multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the annual market demand from such forest for each planning cycle."

Tongass National Forest Land and Resource Management Plan (Forest Plan, as amended)

The Record of Decision for the Tongass Land and Resource Management Plan Revision (Forest Plan) was signed by the Alaska Regional Forester in 1997. The Forest Plan incorporated new resource information and scientific studies and reflected an extensive public involvement process.

There was direction to supplement the 1997 Final EIS to evaluate and consider roadless areas within the Tongass for recommendation as potential wilderness areas as part of the March 2001 US District Court decision on litigation on the 1997 Forest Plan. The Record of Decision for the Supplemental Environmental Impact Statement was signed in February 2003. The No-action Alternative was selected; no additional lands were recommended for Wilderness designation and no changes were made to the land use designations (LUDs) from the 1997 Record of Decision. The 1997 Forest Plan defines appropriate activities within each LUD. Approximately 74 percent of the Tongass is allocated to LUDs where commercial timber harvest is not allowed.

Amendments have been made to the 1997 Forest Plan, primarily to modify small old-growth habitat reserves to meet Forest Plan criteria. These amendments have been accomplished with environmental analysis and are documented in decision documents. Due to those modifications, land use designations (LUDs) in certain areas have changed from development LUDs that allow timber harvest to Old-growth Habitat LUD or changed from the Old-growth Habitat LUD to development LUDs. Since the plan was signed in 1997, these amendments have affected approximately two percent of the acres designated as suitable commercial timber by re-designating them as Old-growth Habitat LUD where timber harvest is not allowed.

The effects to resources in the Final EIS for the 1997 Forest Plan were analyzed as if the full timber harvest allowed under each alternative would occur over the next decade and into the future. In that way the Forest Plan analysis displayed the maximum environmental effects that could be reasonably foreseen. Since substantially less timber volume and acres have been harvested in the first eight years of Forest Plan implementation than was analyzed, the effects on resources are expected to be less than

projected in the 1997 Final EIS. The environmental effects analysis in the Forest Plan estimated 267 MMBF and 10,200 acres would be harvested per year. Forest Plan monitoring indicates that average annual harvest has been less than that amount (Table A-1).

Table A-1
Projected and Actual Tongass Harvest (MMBF)

	Projected Harvest [1]			Actual Harvest
Fiscal Year	Low	Medium	High	
1998	77.3	86.0	112.2	119.8
1999	86.4	99.3	127.9	145.8
2000	95.5	115.9	142.7	146.8
2001	104.6	129.0	157.7	47.8[2]
2002	113.7	134.9	173.1	33.8
2003	122.8	140.8	188.9	50.8
2004	131.9	146.5	205.0	46.0
2005	131.9	152.2	221.4	49.6
2006	131.9	157.8	238.2	
2007	132.0	163.4	255.3	
Average	**112.8**	**132.6**	**182.2**	

[1] From Morse (April 2000) and Brooks and Haynes 1997.

[2] Truncated logging season due to litigation.

On August 5, 2005, the Ninth Circuit Court of Appeals ruled that a misinterpretation of the Brooks and Haynes 1997 draft timber demand projections rendered the 1997 Record of Decision for the Tongass Land Management Plan Revision arbitrary and capricious. The court of appeals remanded the matter for further proceedings consistent with the court's opinion (*Natural Resources Defense Council v. U.S. Forest Service)*. The process of remedying the defects identified by the court of appeals will be time-consuming. Delaying the completion of this and other site-specific projects should be avoided because it would result in substantially undermining the Forest Service's ability to respond to timber demand.

Allowable Sale Quantity (ASQ)

The ASQ serves as an upper limit on the amount of timber that may be offered for sale each year as part of the regularly scheduled timber sale program. The Record of Decision for the 1997 Forest Plan states:

> The maximum amount of timber that could be harvested (Allowable Sale Quantity or ASQ) during the first decade of the Forest Plan implementation is an average of 267 MMBF per year. A timber volume level less than the ASQ is likely to be offered over the next few years, given current market conditions, the transition that both the timber industry and the Forest Service are experiencing, and the current amount of appeals and litigation.

The ASQ is the amount of sustainable timber that can be harvested from suitable forested lands allocated to development by the Forest Plan, in accordance with standards and guidelines and other limitations set out in the plan. It consists of two separate Non-Interchangeable Components (NICs) called NIC I and NIC II. The NIC I component includes lands that can be harvested with normal logging systems including helicopter logging with less than ¾ mile yarding distance. The NIC II component includes land that has high logging costs due to isolation or special equipment requirements. Most of these NIC II lands are presently considered economically and technically marginal.

There are two purposes of partitioning the ASQ into two components: (1) to maintain the economic sustainability of the timber resource by preventing the over-harvest of the best operable ground and, (2) to identify that portion of the timber supply that may not be harvested because of marginal economic conditions.

With regard to timber production sustainability, the decision for the 1997 Forest Plan further states:

> The timber resource will be managed for production of sawtimber and other wood products from timberlands available for sustainable timber harvest, on an even-flow, sustained-yield basis and in an economically efficient manner. The Tongass National Forest will seek to provide a timber supply sufficient to meet the annual market demand for Tongass National Forest timber and the market demand for the planning cycle.
>
> The Tongass National Forest will continue to allow timber harvest while maintaining sustained yield and multiple-use goals. The forest-wide standards and guidelines for timber include general direction to "[e]nsure that silvicultural systems other than clearcutting are considered through an appropriate project level analysis process." However, uneven-aged management systems will be limited to areas where yarding equipment suited to selective logging can be used.

Roadless Area Conservation Rule

The January 2001 Roadless Area Conservation Rule prohibited most timber harvest and road construction in inventoried roadless areas on National Forest System lands. In July 2003, the US District Court for the District of Wyoming set aside the roadless rule and permanently enjoined its implementation. Effective January 2004, after analysis of current conditions and public comment, the Department of Agriculture amended the roadless rule so that actions on the Tongass are not subject to the prohibitions against commercial harvest and road building in the roadless rule. Management of inventoried roadless areas on the Tongass is now governed by the 1997 Forest Plan.

In May 2005, the Forest Service adopted a new rule that established a petitioning process that provides Governors the ability to request adjustments to management of inventoried roadless areas on national forests within their states. Submission of a petition is strictly voluntary, and management requirements for inventoried roadless areas are guided by the Tongass Forest Plan until and unless these management requirements are changed through a State-specific rulemaking. If the Secretary of Agriculture accepts a petition, the Forest Service shall be directed to initiate notice and comment rulemaking to address the petition. This 2005 rule negates the need for further Tongass-specific rulemaking anticipated in the 2003 temporary withdrawal.

An analysis of the effects to roadless areas within the project area has been included as part of the analysis for this project. This project is consistent with agency policy and procedures and has been designed to meet the management direction, goals and objectives, and standards and guidelines in the Forest Plan.

How does the Forest Service Develop Forecasts about Future Timber Market Demand?

Annual Market Demand

Consistent with the provisions of the Tongass Timber Reform Act, the Tongass National Forest makes two determinations on volume to be offered. The first is an estimate on volume to be offered for the current year, based on a forecast of annual timber market demand. Annual market demand is analogous to assessing industry performance in the short-term. The general approach is to consider the timber requirements of the region's sawmills at different levels of operation and under different assumptions about market conditions and technical processing capability.

Timber inventory requirements are acknowledged and included in the timber demand forecast. These assumptions provide a basis for estimating the volume of timber likely to be processed by the industry as a whole in any given year. The volume of timber likely to be purchased is equal to

the volume needed to make up any inventory shortfall in addition to the volume likely to be harvested in the coming year.

The annual market demand forecast is a methodology used to set the short term goals for the Tongass timber sale program – it is the projected volume of Tongass timber needed to meet annual market demand. The estimated annual market demand is the volume the Forest plans to offer for sale in the current year, pending sufficient funding.

The reports *Responding to the Market Demand for Tongass Timber* (Morse, April 2000) and *Tongass National Forest Timber Sale Procedures* (Morse, October 2000) document the formulas and procedures used in forecasting annual market demand. The procedures are designed to be flexible given the uncertainty associated with forecasting market conditions. This is especially difficult in Southeast Alaska because of the structural transformation underway in the timber industry. The methodology accounts for the fact the Forest Service timber sale program cannot quickly respond to market fluctuations and allows the industry to accumulate adequate volume under contract. The methodology includes provisions to monitor industry behavior and includes ways to adjust timber sale program levels to reflect harvest activity.

The methodology used by Morse documents the formulas and procedures used in forecasting annual market demand, and uses the correct demand numbers from the 1997 Brooks and Haynes report. In addition, the methodology is self-correcting based on actual experience and considers such factors as mill capacity, utilization, and volume under contract. To the extent that actual harvest is lower than projected harvest, the inventory of timber under contract builds up and the demand for new timber decreases, as long as economic volume is available. The annual demand for FY 06 is projected to be 153 mmbf. The spreadsheet displaying how this demand is calculated and a summary of the factors use in these calculations are in the project record.

The planned offer could include a combination of new, previously offered, and reconfigured timber sales. Both green timber and salvage will be components of the program. Offerings will consist of those targeted for Small Business qualified firms, as well as a portion of the volume being made available for the open market.

Market Demand over the Planning Cycle

The second level of market demand is for the volume needed over a planning cycle. To keep the planning cycle demand current, each fiscal year the timber sale plan is updated for each Ranger District, whereby the current year is dropped at the end of the fiscal year and a new year is added. These plans from the Ranger Districts are then consolidated into the Tongass Timber Sale Plan. In the past, the Tongass prepared a 10-year timber sale plan. For several reasons, in FY 06, a 5-year timber sale plan was prepared, which is consistent with Forest Service Manual 2430. The reasons for using a 5-year timber sale plan include: (1) the difficulty of

projecting changing market conditions, (2) the outcome of timber harvest decisions affected by litigation, and (3) the time it will take to remedy the Forest Plan to be consistent with the court's opinion (*Natural Resources Defense Council v. U.S. Forest Service*). This shorter plan will contain more accurate information for potential purchasers based on completed and ongoing environmental analyses and provide a plan that is easier to adjust as market conditions fluctuate.

Demand projections are important for timber sale program planning. They provide guidance to the Forest Service to request budgets, to make decisions about workforce and facilities, and to indicate the need to begin new environmental analysis for future program offerings. They also provide a basis for expectations regarding future harvest, and thus provide an important source of information for establishing the schedule of probable future sale offerings. The weight given to the projections will vary depending on a number of factors, such as how recently they were done and how well they appear to have accounted for recent, site-specific events in the timber market.

What Steps Must Be Completed to Prepare a Sale for Offer?

The Tongass National Forest's timber sale program is complex. A number of projects are underway at any given point in time, each of which may be in a different stage of planning and preparation. A system of checkpoints, or "gates" (Forest Service Handbook 2409.18, Chapter 10), helps the Forest Service track the accomplishments of each stage of a project from inception to contract termination.

Gate 1 – Initial Planning of Timber Sale Project

A Timber Sale Project Plan, often referred to as a Position Statement, is a brief analysis of the project area with the intent of determining the feasibility of a potential timber sale. After the Position Statement is developed, the Forest Service decides whether the project area merits continued investment of time and funds in sale planning.

Gate 2 – Project Analysis, Sale Area Design, and Decision

This step is commonly referred to as the "NEPA" phase and includes field work, public scoping, analysis, draft disclosure of the effects of the project on the environment, public comment, final analysis and disclosure, decision, and potentially administrative appeals and litigation. Gate 2 activities are generally completed two to three years before a sale is offered. Legislation, policy changes, and appeals and litigation have recently extended completion of some projects for a much longer timeframe, often doubling the desired time frame.

Gate 3 – Preparation of a Timber Sale

During this step, the information and direction included in the decision document from Gate 2 is used to layout units and design roads on the ground. Additional site-specific information is collected at this time. In order to maintain an orderly flow of sales, Gate 3 activities should be completed one to three years before a sale is offered.

Gate 4 – Advertise a Timber Sale

The costs and value associated with the timber sale designed in Gate 3 are appraised and packaged in a timber sale contract. The contract is a legally binding document that tells a prospective timber sale purchaser how the sale must be harvested to conform to the project decision document. This step occurs during the final year of the project development and culminates with the advertisement of the project for sale.

Gate 5 – Bid Opening

Gate 5 is completed with the opening of bids for the project. If a bid is submitted, contractual provisions govern when the award of the sale takes place, when the sale will be completed (contract length and operation season), and how timber removal is to occur.

Gate 6 – Award a Timber Sale Contract

Gate 6 is the formal designation of a contract between a bidder and the Forest Service.

How does the Forest Service Maintain an Orderly and Predictable Timber Sale Program?

Pools of Timber (Pipeline Volume)

As discussed earlier, the Forest Service tracks the accomplishment of the different steps of development of each timber sale with the Gate System process. From a timber sale program standpoint, it is also necessary to track and manage multiple projects through a "pipeline" of time as projects collectively move through the Gate System. Because of the timeframes needed to accomplish a given timber sale and the complexities inherent in timber sale project and program development, it is necessary to track various timber sale program volumes from Gate 1 through Gate 6.

The goal of the Tongass National Forest is to provide an even flow of timber sale offerings on a sustained yield basis to meet market demand. In recent years, this has been difficult to accomplish due to a combination of uncertainties such as delays related to appeals and litigation; changing economic factors, such as rapid market fluctuations; and industry related factors, such as changes in timber industry processing capabilities. To achieve an even flow of timber sale offerings, 'pools' of volume in various

stages of the Gate System are maintained so volume offered can be balanced against current year demand and market cycle projections.

Today, upward trends in demand are resolved by moving out-year timber projects forward, which may leave later years not capable of meeting the needs of the industry. In other instances, a number of new projects are started based on today's market but will not be available for a number of years. By the time the added projects are ready for offer, the market and demand for this volume may have changed. Three pools of timber volume are tracked to achieve an even flow of timber sale offerings.

The objective of the timber pools concept is to maintain sufficient volume in preparation and under contract to be able to respond to yearly fluctuations in a timely manner. Refer to Table A-2, which displays the projected volume in each pool, as well as the goal for volume. Based on historic patterns, the Tongass has established a goal for the volume to be maintained in each of the timber pools. Appeals and litigation can cause timber sale projects to be reevaluated to ensure they meet current standards and direction, which can cause delays in making projects available to move through the pools, thereby not fully meeting the goals for volumes in each pool.

Pool 1 - Timber Volume Under Analysis (Gate 1 and Gate 2)

Volume in Gate 1, the initial planning step, represents a large amount of volume, but represents a relatively low investment in each project. This relatively low investment level offers the timber program manager a higher degree of flexibility and thus, does not greatly influence the flow of volume through the pipeline.

Gate 2, Timber volume under environmental analysis, includes sales being analyzed and undergoing public comment through the NEPA process. This pool includes any project that has started the scoping process through those projects ready to have a decision issued. In addition, tracking how much volume is involved in appeals or litigation may be necessary to determine possible effects on the flow of potential timber sales. Volume in appeals and litigation is tracked as a subset of this pool as necessary (Table A-3).

Based on historic patterns, the Tongass has established a goal for the pipeline volume to be maintained in each of the timber pools. The goal for Pool 1 is to be maintained at approximately 4.5 times the amount of the projected harvest to account for projects at various stages of analysis. That goal reflects a number of factors which can lead to a decrease in volume available, such as a decision in Gate 1 to drop further analysis in a particular planning area (called the "no go" decision), a falldown in estimated volume between Gate 1 and Gate 2, and volume not available for harvest due to appeals or litigation.

Table A-2: Accomplishments in gate system and timber pools (MMBF)

Pipeline Pool Volume	Goal	FY05 As of 11/10/05
Pool 1 Volume Under Analysis (Gate 1 and 2)	594[1]	309
Pool 2 Volume Available for Sale (Gate 3, Gate 4 and Gate 5)	172 [2]	239[3]
Pool 3 Volume Under Contract (Gate 6)	396[4]	74[5]

[1] The goal for volume under analysis is approximately 4.5 times the projected harvest for the current year (132 MMBF for 2006 based on PNW estimates). Volume under analysis includes all volume in projects from the Notice of Intent through completion of the environmental analysis for sales planned.

[2] The goal for volume available for sale is to have at least 1.3 times the projected harvest for the current year (132 MMBF) in sales that have approved NEPA and completion of timber sale preparation.

[3] Includes volume from sales mutually cancelled under the provision of the 2004 Appropriations Act (Sec. 339). However, much of this volume appraises deficit and could not be offered for sale under Congressional direction in the 2006 Appropriations Act (Public Law 109-54, Sec. 416). Does not include volume under litigation – see Table A-3.

[4] The goal for volume under contract is for purchasers to have 3 times the volume under contract as projected for harvest for the current year (132 MMBF). Does not include volume for FY 05 offerings (58 mmbf) that have received bids but have not been awarded or sales that have had mutual cancellation requests granted.

[5] Estimated volume under contract available for harvest (not including timber enjoined from harvest).

Pool 2 - Timber Volume Available for Sale (Gates 3, 4 and 5)

Timber volume available for sale includes sales for which environmental analysis has been completed, and have had any administrative appeals and litigation resolved. Enough volume in this pool is needed to be maintained to be able to schedule future sale offerings of the size and configuration that best meets market needs in an orderly manner.

As a matter of policy and sound business practice, the Forest Service announces probable future sale offerings through the Periodic Timber Sale Announcement. Recent delays at Gate 2 have affected sale preparation and have made scheduling uncertain. At Gate 4, sales have been fully prepared and appraised, and are available to managers to advertise for sale. This allows potential purchasers an opportunity to do their own evaluations of these offerings to determine whether to bid, and if so, at what level.

Timber in this pool can include a combination of new sales, previously offered unsold sales, and remaining volume from cancelled sales. The goal is to maintain Pool 2 at approximately 1.3 times the amount of the projected harvest to allow flexibility in offering sales.

Table A-3: Timber volume involved in appeals and/or litigation[1]

Timber volume remanded on appeals[2]	35 MMBF
Timber volume involved with litigation	215 MMBF
Timber volume under contract enjoined from implementation	12 MMBF

[1] As of November 10, 2005

[2] Remanded – Decision overturned during internal review. Does not include that volume in decisions currently in the appeal period or undergoing an appeal.

Pool 3 - Timber Volume under Contract (Gate 6)

Timber volume under contract contains sales that have been sold and a contract awarded to a purchaser, but which have not yet been fully harvested. Contract length is based on the amount of timber in the sale, the current timber demand, and takes into account the accessibility of the area for mobilization. The longer the contract period, the more flexibility the operator has to remove the timber based on market fluctuations. Timber contracts typically initially give the purchaser three years to harvest and remove the timber purchased. Analysis of recent Tongass timber sales indicates an average sale length of about six years.

The Tongass attempts to maintain roughly three years of unharvested volume under contract to the industry as a whole. This volume of timber is the industry's dependable timber supply, which allows adaptability for business decisions. This practice is not limited to the Alaska Region, but is particularly pertinent to Alaska because of the nature of the land base. The relative absence of roads, the island geography, the steep terrain, and the consequent isolation of much of the timber land means that timber purchasers need longer-than-average lead times to plan operations, stage equipment, set up camps, and construct roads prior to beginning harvest.

A combination of projected harvest and projected demand is used to estimate the volume needed to maintain an even flow timber sale program. As purchasers harvest timber, they deplete the volume under contract. Timber harvest is then planned and offered by the agency as sales that give the industry the opportunity to replace this volume and build or maintain their working inventory. Although there will be variation for practical reasons from year to year, in the long-run over both the high points and low points of the market cycle, the volume harvested will equal the timber volume sold.

The goal for Pool 3, volume under contract, is to maintain at approximately three times the amount of projected harvest to allow the

purchasers to have a continuous supply of timber volume available for harvest so they can plan their operations.

How Appeals and Litigation Affect the Timber Sale Program

Timber harvest projects require site-specific environmental analysis that usually is documented in an environmental assessment (EA) or an environmental impact statement (EIS). The public is notified of the analysis and is provided the opportunity to comment on proposals and file an appeal on decisions. The appeal process for most timber harvest projects takes up to 105 days before implementation to occur.

When decisions are appealed and affirmed through the appeal process, the project can still be litigated. Litigation can be a lengthy process. Although litigation does not preclude offering timber for sale, the Forest Service and potential purchasers are often reluctant to enter into a contract where the outcome is uncertain. Two sales within the last year were enjoined from harvest after the contracts were awarded. The outcome of litigation affects the Forest's ability to provide a reliable timber supply.

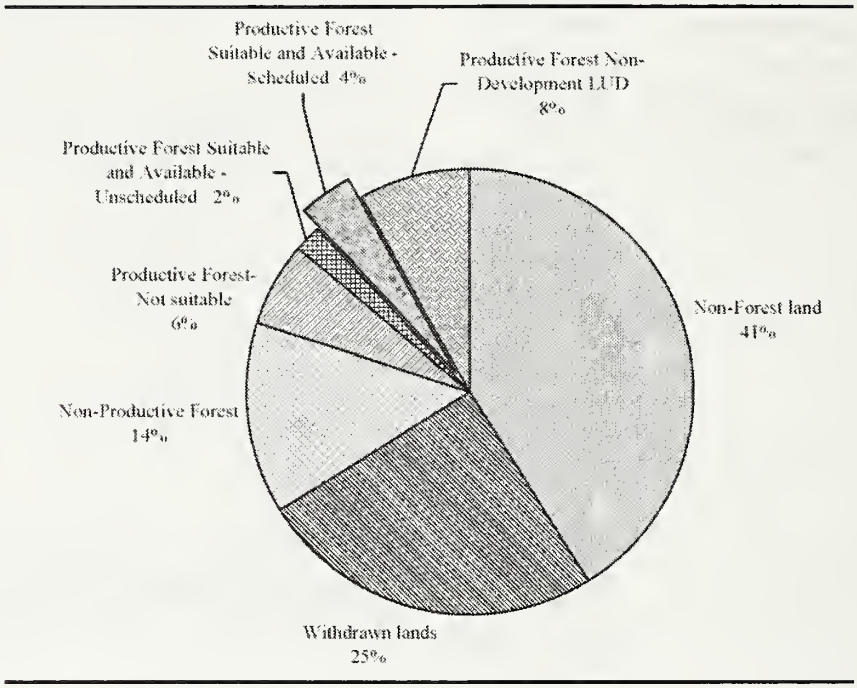
How Does the Forest Service Decide Where Timber Harvest Projects should be Located?

The location of timber sale projects is based first on the land allocation decisions in the Forest Plan. Under the 1997 Forest Plan, lands designated for possible timber harvest are in the development land use designations (LUDs), primarily the Timber Production, Modified Landscape, and Scenic Viewshed Land Use Designations.

Timber Resource Land Suitability

The second consideration is the suitability of the land for timber production. Many acres within the development LUDs are not suitable for timber production due to poor soils or steep slopes. The process for determining the suitability of the land is found in the Forest Plan, Appendix A. Figure A-1 depicts the classification of all the lands within the Tongass National Forest. Four percent of the Tongass land base, the suitable, available and scheduled forest land, provides the land base for the Allowable Sale Quantity of 267 MMBF per year. Under the 1997 Forest Plan, the remainder of the land, approximately 96 percent, does not allow, is not scheduled, or is not physically suitable.

Figure A-1. 1997 Forest Plan Timber Resource Suitability Analysis



Non-Forest land – Land that has never supported forests, e.g. muskeg, rock, ice
Withdrawn Lands – Lands designated by Congress. the Secretary of Agriculture, or Chief for purposes that preclude timber harvest, e.g. Wilderness Areas.
Non-productive Forest – Forest land not capable of producing commercial wood on a sustained yield basis.
Productive Forest, Not suitable, Physical Attributes – Forest land unsuitable for timber production due to physical attributes (steep slopes, soils, etc) and/or inadequate information to ensure restocking of trees within 5 years of final harvest.
Productive Forest, Not suitable, Non-development LUD – Productive forest lands where timber production is not allowed due to Forest Plan land use designation e.g. Semi-Remote Recreation, Old-growth Habitat, etc.
Productive Forest, Suitable and Available, Scheduled – Forest land that meets all the criteria for timber production suitability and is available and is scheduled by the Forest Plan over the planning horizon.
Productive Forest Suitable and Available, Unscheduled – Forest land that meets all the criteria for timber production suitability, is available for harvest, however was not scheduled in the Forest Plan model for harvest.

District-Level Planning

The Tongass National Forest is divided into ten ranger districts. For planning and scheduling purposes, the allowable sale quantity has been allocated to the ranger districts based on the Forest Plan modeling (FORPLAN) results of suitable and available acreage. The average annual distribution of the full Forest Plan allowable sale quantity by ranger districts is displayed in Table A-4 (all volumes are identified as sawlog plus utility).

Table A-4: Annual projected distribution of Forest Plan allowable sale quantity (MMBF)

Ranger District	Non-Interchangeable Component (NIC) [1]	
	NIC I	NIC II
Ketchikan/Misty Fiords	32	7
Thorne Bay	42	9
Craig	33	7
Wrangell	28	6
Petersburg	50	9
Sitka	17	4
Hoonah	7	2
Juneau	7	2
Yakutat	4	1
Admiralty National Monument	0	0
NIC Totals	**220**	**47**
ASQ Total	**267**	

[1] NIC I component - lands that can be harvested with normal logging systems including helicopter logging with less than ¾ mile yarding distance. NIC II component includes land that has higher logging costs due to isolation or special equipment requirements.

The Forest Supervisor for the Tongass National Forest is responsible for the overall management of the Forest's timber sale program. Included within these responsibilities is making the determination on the amount of timber volume to be made available to industry. Whether or not sufficient funding is appropriated to attain the program is the responsibility of the Congress and the President.

While the Congressional appropriation process is taking place, the Tongass Forest Supervisor directs the District Rangers to develop a timber sale plan that is the best estimation of the potential timber harvest projects to attain the prescribed offer level for the current year based on annual market demand, as well as developing a timber program for the planning cycle, based on the NIC I average for the ranger districts. The offer level for the current year in this plan is based, to the extent possible, on the forecasted annual market demand. Demand may fluctuate from year to year but recent years have shown little change in the annual demand projection. Offerings may vary from year to year but recently they have been in the low market scenario range, as determined by the projected annual demand.

The District Ranger is responsible for identifying and recommending the project areas for the timber sale plan. The Ranger's role is to develop and recommend to the Forest Supervisor timber harvest projects that meet Forest Plan goals and objectives. Districts work on various timber sale projects simultaneously, resulting in continual movement of projects

through the stages of the timber program pipeline. This schedule allows the necessary time to complete preliminary analysis, resource inventories, environmental documentation, field layout preparations and permit acquisition, appraisal of timber resource values, advertisement of sale characteristics for potential bidders, bid opening, and physical award of the timber sale. Project delays through the completion of Gate 2 attributable to legal injunctions and litigation has affected the offer level in recent years. Once all of the Rangers' recommendations are made and compiled into a consolidated schedule, the Forest Supervisor is responsible for the review and approval of the final timber sale plan.

Some of the considerations the District Ranger takes into account for each project include:

- The project area contains a sufficient number of suitable timber production acres allocated to development land use designations. Available information should indicate that the timber volume being considered for harvest can be achieved while meeting Forest Plan goals, objectives, and standards and guidelines
- Other resource use and potential future uses of the area and of adjacent areas and of non-National Forest System lands.
- Areas where the investment necessary for project infrastructure (roads, bridges, etc.) is achievable with the estimated value of timber in the project area. Where infrastructure already exists, the project would allow any maintenance and upgrade of the facilities necessary for removal of timber volume.
- Areas where investments for the project coincide with long-term management based on Forest Plan Direction.

The implementation of the sales on the timber sale plan depends in part on the final budget appropriation to the agency. In the event insufficient budget is allocated, or resolution of pending litigation or other factors delay planned sales, timber sale projects are selected and implemented on a priority basis. Generally, the higher priority projects include sales where investments such as road networks, camps or log transfer facilities have already been established or where land management status is not under dispute. The distribution of sales across the Tongass is also taken into account to distribute the effects of sales and to provide sales in proximity to timber processing facilities. Timber sale projects, scheduled for the current year that are not implemented or the remaining volume of sales that are only partially implemented are shifted to future years in the plan. The sale plan becomes very dynamic in nature due to the number of influences on each district.

The Kuiu Timber Sale project meets all laws and regulations governing the removal of timber from National Forest System lands, including Forest Service policies as described in Forest Service manuals and handbooks

and the 1997 Forest Plan and ROD. Based on current year and anticipated future timber volume demand and the timber supply provisions of the Tongass Timber Reform Act, the analysis of the Kuiu Timber Sale project is prudent at this time to meet timber sale needs as included on the 5-year Timber Sale Plan. The anticipated budget allocations and the availability of resources are sufficient to prepare and offer this project for sale as scheduled.

How Does This Project Fit into the Tongass Timber Program?

The Kuiu Timber Sale project is currently in Gate 2, project analysis. The amount of volume considered for harvest under the action alternatives ranges from 14.6 MMBF to 42.6 MMBF which would contribute to the Tongass timber sale program. A no-action alternative is also analyzed in this EIS. If an action alternative is selected in the decision for the Kuiu Timber Sale project, this volume will be added to the volume available for sale.

As described in the Pools of Timber section of this appendix, the volume of timber needed to maintain Pool 1 is 4.5 times the amount of the projected harvest to account for projects at varying stages of analysis for that year. As displayed in Table A-2, the goal for volume under analysis is 594 mmbf. Currently, forest-wide, the volume under analysis (Pool 1) is about 309 MMBF and includes the volume for this project. The Kuiu Timber Sale project contributes to timber sale program planning objectives and is necessary to meet the goal of providing an orderly flow of timber from the Tongass on a sustained yield basis to meet timber supply requirements. It is reasonable to be conducting the environmental analysis for this project at this time. The Kuiu Timber Sale project is currently proposed for offer in Fiscal Year 2006.

Why is this Project Occurring in this Location?

As explained above, timber harvest project areas are selected for environmental analysis for a variety of reasons. The reasons this project is being considered in this area include:

As displayed in the 1997 Tongass Forest Plan, the suitable and scheduled land base on the Tongass National Forest is capable of supporting an Allowable Sale Quantity of 267 MMBF annually, 220 MMBF of which is considered economical (i.e. the NIC I component) under average market conditions. The Forest Plan analysis assumed all suitable, scheduled timberlands would eventually be planned for harvest to meet the current and projected demand for timber in Southeast Alaska. The relocation of this project to another area is inefficient and potentially contrary to the standards and guidelines of the Forest Plan. This decision is based on the consideration of cumulative effects on other resources from past harvest activities, the location of timber sales under contract, and the eventual use of all suitable and scheduled lands for timber sale projects.

The reasons this project is being considered in this area include:

- The area is identified in the Forest Plan as Timber Production LUD.
- The Kuiu Timber Sale Area contains sufficient acres of suitable and available forest land to make this timber harvest proposal reasonable. Areas with available timber need to be considered for harvest in order to seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand from such forest, and (2) meets the market demand from such forest for each planning cycle, pursuant to Section 101 of the Tongass Timber Reform Act (TTRA).
- Providing substantially less timber volume than required to meet Forest Plan and TTRA Section 101 timber supply and employment objectives in order to avoid harvest in the project area is not necessary or reasonable.
- There is an existing road system and only temporary roads are required to access the timber.
- There are two LTFs with the associated sort yards available for log transfer. The Rowan Bay LTF would require no upgrading and the Saginaw Bay LTF would require some reconstruction, including the development of a low angle barge ramp.

Effects on subsistence resources from timber harvest are projected to have few differences based on the sequence in which areas are harvested. Harvesting other areas with available timber on the Tongass National Forest is expected to have similar potential effects on resources, including subsistence resources, because of widespread distribution of subsistence use and other factors. Harvest within other areas is foreseeable under the Forest Plan.

Conclusion

There is a long legislative recognition that timber harvest is one of the appropriate activities on national forests, starting with the founding legislation for national forests in 1897. The National Forest Organic Act provides that national forests may be established "*to improve and protect the forest within the boundaries of, or for the purposes of securing favorable conditions of water flows and to furnish a continuous supply of timber for the use and necessities of the citizens of the United States.*"

Congress' policy for national forests, as stated in the Multiple Use Sustained Yield Act of 1960, is as follows: "The national forests are

established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes." Accordingly, Congress has authorized the Secretary of Agriculture to sell trees and forest products from the national forests "at no less than appraised value." The National Forest Management Act directs that forest plans shall "provide for multiple use and sustained yield, and in particular, include coordination of "outdoor recreation, range, timber, watershed, wildlife, fish and wilderness.

In addition to nationwide statutes, section 101 of the Tongass Timber Reform Act directs the Forest Service to seek to meet market demand for timber from the Tongass. It is the goal of the Tongass National Forest to provide an even flow of timber on a sustained yield basis and in an economically efficient manner. The amount of timber offered for sale each year is based on the objective of offering enough volume for sale to meet the projected annual demand. That annual demand projection starts with installed mill capacity, and then looks to industry rate of capacity utilization under different market scenarios, the volume under contract, and a number of other factors, including anticipated harvest and the range of expected timber purchases.

As described by Morse (April 2000), in terms of short term economic consequences, oversupplying the market is less damaging than undersupplying it. If more timber is offered than purchased in a given year, the unsold volume is still available for re-offer in future years. The unsold volume would have no environmental effects because it would not be harvested. Conversely, a shortfall in the supply of timber can be financially devastating to the industry. The Kuiu Timber Sale project could supply from 14.6 MMBF to 42.6 MMBF of volume for sale, with harvest potentially beginning in 2006.

References

David Brooks and Richard Haynes, September 1997, *Timber Products Output and Timber Harvest in Alaska: Projections for 1997-2010,* USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-409.

Kathleen Morse, April 2000, *Responding to the Market Demand for Timber, Using Adaptive Management to Implement Sec. 101 of the 1990 Tongass Timber Reform Act,* USDA Forest Service, Alaska Region, R10-MB-413.

Kathleen Morse, October 2000, *Tongass National Forest Timber Sale Procedures, Using Information about Market Demand to Schedule FY 2001 Timber Offerings*, USDA Forest Service, Region 10.

Organic Act of 1897, 16 USC 473-481

Multiple-Use Sustained Yield Act of 1960, 16 U.S.C. 528-531

National Forest Management Act (NFMA) of 1976 (16 U.S.C. 472a)

Alaska National Interest Lands Conservation Act (ANILCA; P.L. 96-487, 1980)

Tongass Timber Reform Act (TTRA; P.L. 101-625, 1990)

Appendix B
Activity Cards

Appendix B Table of Contents

Introduction to Appendix B

Activity cards are used to explain site-specific proposed activities and any resource concerns and responses. These activities include timber harvest units and proposed and existing roads needed for timber harvest. Both narratives and maps showing site-specific information are provided.

The first section of this introduction explains the harvest treatments proposed for this entry. The next section provides a summary of resource concerns and design elements used in response to those concerns. These actions can be either from the Forest Plan or project-specific.

The introduction to Appendix B is followed by a narrative card and a map for each proposed harvest unit. These units are in numerical order. Not every unit is in each alternative. The alternatives are listed both on the narrative card and on the map. The maps show all proposed adjacent units whether or not they are in the same alternatives. Figure B-1 shows all the units as they lie in the project area.

The last section of this Appendix lists existing classified roads used for the alternatives. It describes the current conditions and management objectives, and proposed road management objective changes. The Introduction to the Road Cards explains the terminology used for the Road Management Objective narrative. A map is included that shows all the roads and their desired future management.

Unit Card Header Information

Each unit card has a header block with information used to generally describe the stand's size, location, and volume proposed for harvest. Each header block contains the following information:

Unit Number: This is the number assigned to the unit block during the Logging Systems and Transportation Analysis development.

Unit Acres: This is an estimate of total acres within the unit using aerial photos and GIS information.

Alternatives: This identifies the alternative(s) in which the unit is proposed.

Aerial Photo: This is the identification number of the most recent aerial photograph taken during 1998-99.

Land Use Designation (LUD): Land Use Designation is a defined area of land, identified by the Forest Plan, to which specific management direction is applied. All proposed units are in the Timber Production LUD.

Net Timber Volume: This is an estimated volume in thousand board feet to be harvested. This was derived from field estimates and the stand exam program. A cruise will be done during implementation to determine an accurate volume before the timber is sold.

TM Compartment and Stand: This identifier is used for tracking purposes from planning through implementation and future treatments.

Volume Strata Acres: This is the approximate number of acres broken out by volume strata. Three volume strata (high, medium, and low) are recognized in the Forest Plan and explained in the Timber and Vegetation section of Chapter 3.

Existing Stand Condition: This is the developmental stage of the physical and temporal distribution of trees and other plants in a forested area.

Silvicultural Prescription: This provides information about the methods, techniques, timing, and monitoring of vegetative treatments. The detailed silvicultural prescription is in the planning record.

Logging Method: This identifies the method of logging in the unit.

Harvest Treatments

Silvicultural Systems

Silvicultural systems refer to a complete set of treatments used to manage forest stands and forest landscapes over long periods of time. This process includes the harvest or regeneration of the stand, intermediate cuttings, and other treatments necessary for the development and replacement of the forest stand.

Silvicultural systems are applied through prescriptions, the written records of the examination, diagnosis, and treatment regimes prescribed for the stand.

A diagnosis has been written for each unit and a complete silvicultural prescription will be written for each unit selected for harvest in the Record of Decision. These prescriptions provide guidance for treatments following this proposed timber harvest, including subsequent entries, cedar interplanting, thinning, pruning, and fertilization through the entire rotation.

Silvicultural prescriptions include these unit cards plus the sale layout and marking guidelines that would be completed for each of the timber harvest units that are included in the Kuiu Timber Sale Area Record of

Decision. Minor changes can be expected during implementation to better meet on-site resource management and protection objectives. Minor adjustments to unit boundaries are also likely during final layout for the purpose of improving logging system efficiency or for site conditions.

These cards will be used during the implementation process to assure that all aspects of the project are implemented within applicable standards and guidelines. If needed, during sale implementation, an interdisciplinary team will discuss any changes. Subsequent analysis and supplements to the EIS may be needed, as determined by the Responsible Official. Similar cards will be used to document any changes to the planned layout as the actual layout and harvest of the units occur with project implementation.

The harvest treatments found on the unit cards are descriptions of what will occur under various silvicultural systems. Even-aged management will result in the conversion of mature stands to faster growing stands of a single age. Uneven-aged management will result in a stand with younger trees interspersed with older trees, either in clumps or distributed across the stand. The post-harvest conditions of the forest stand for all systems will be dependent upon the existing plant community, the retained canopy structure, and advanced regeneration. Species composition will be monitored to ensure that the mix of species is roughly the same as expected on the existing site.

Even-aged Management, Clearcut

All merchantable trees will be harvested. The objectives of this system are to create a fast-growing stand of trees to maximize wood fiber production, favorable timber sale harvest economics and logging feasibility. These stands would regenerate into a mostly single-aged stand. Where this treatment is recommended, it has been determined that it is optimal for the site and the created openings would not exceed 100 acres, to be in compliance with the National Forest Management Act. The harvest method chosen to achieve this treatment is clearcutting. During layout of the unit if changes are made to the boundary, a change analysis must be completed. The change analysis includes mapping and documenting the actual layout and rationale for those changes. No change that may lead to units with opening sizes over 100 acres would be approved.

Two-aged Management

This system regenerates and maintains a stand with two age classes. Removing trees in clumps or as individual trees. Reserves or clumps would be distrubuted somewhat evenly across the harvest unit or stand, and away from the unit boundary. The resulting stand may be two-aged or trend toward the uneven-aged condition as a consequence of both an extended period of regeneration establishment and retention of reserve trees that may represent one or more age classes. Two-aged management regimes can produce stands of greater structural diversity

than even-aged management. These stands would not be reentered for harvest until the next rotation in approximately 100 years.

Uneven-aged Management

This system regenerates and maintains a multi-aged structure by removing some trees in all size classes either singly, in small groups, or in strips. Uneven-aged management maintains or creates a stand with trees of three or more distinct age (size) classes, either intimately mixed or in small groups. This remaining structure provides wildlife habitat and reduces visual impacts. The next entry into these stands would be in approximately 75 years, when approximately 25 percent of the stand's pre-harvest basal area would be removed in patches or in single trees.

Group Selection

Stands proposed for this system would have approximately 50 percent of the basal of the trees remaining after harvest. Merchantable trees (trees greater than 9 inches in diameter) would be harvested in small patches to form a mosaic of irregularly shaped openings within the stand. Smaller trees may be left in this area if the larger trees can be safely removed. Each group harvested would consist of a mixture of tree sizes. Each harvested opening will regenerate, creating a patch of trees with a uniform age and height. These openings may be thinned. This will create a stand of three or more distinct size classes in small groups, resulting in an uneven-aged stand.

Single Tree Selection

Stands proposed for this system would have approximately 50 percent of the basal area of the trees remaining after harvest. This will regenerate and maintain a multi-aged structure by removing some trees in various size classes distributed across the stand. Trees to be harvested would be selected using a criterion such as species, diameter limits or spacing. A range of diameters, or everything above or below a certain diameter limit, may define the trees selected for harvest. Different diameters may be used for different species. The resulting stand may have small openings plus individual trees harvested throughout the stand. This will maintain or create a stand of three or more distinct size classes distributed throughout the stand, resulting in an uneven-aged stand.

Resource Concerns and Responses

In the Kuiu Timber Sale Area, most of the economic, wildlife, and watershed concerns are mitigated with the silvicultural system. Other resource concerns, such as soils, scenery, and fisheries, are mitigated by unit design and adherence to Forest Plan standards and guidelines and Best Management Practices (BMPs).

Wildlife and Biological Diversity

Old Growth Habitat

Loss of old-growth habitat is a wildlife concern for most of the proposed harvest units. The use of 50 percent retention of the basal area with the retention of trees of various sizes, and an emphasis on snags and dying trees, helps mitigate this concern. Other areas of concern are mitigated through unit selection by alternative and old-growth habitat reserve selection. Depending upon which alternative and old-growth habitat reserve are chosen, differing prescriptions and corridor retentions will mitigate many of the concerns for the species selected as Management Indicator Species (MIS) for this project.

Three alternative small old-growth habitat reserve (OGR) options are presented in the Kuiu Timber Sale Area DEIS. The options were designed through an interdisciplinary process with the input of the U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game. The options meet the intent of the Forest Plan.

The Issue 2- Wildlife Habitat and Subsistence section of Chapter 3 describes and compares the old-growth habitat reserve options. Each OGR option would retain portions of the remaining patches of old-growth timber within the project area. These patches are connected to other patches of habitat by means of Estuary, Beach, Riparian and Old-growth Habitat Land Use Designations.

Sitka Black-tailed Deer

Changes in deer habitat due to timber harvest may increase populations in the short-run. However, if stands are allowed to mature in a natural fashion, the habitat will, over time, decrease in habitat value through plant succession. Several silvicultural treatments are available to maintain the habitat value to deer and other species. Pre-commercial thinning, commercial thinning, and pruning help maintain the understory in these stands while allowing the trees to grow faster and straighter.

Reduction of fragmentation is also an important component of maintaining deer habitat. Low-elevation high value deer habitat occurs on southern slopes with a coarse canopy of older trees. Where practical, corridors will be maintained to allow movement of deer from lower elevation stands to high elevation stands. As mentioned above, the selection of an old-growth habitat reserve will help mitigate this concern.

Threatened, Endangered, and Sensitive Species

No threatened, endangered, or sensitive species have been located within the project area. Any nests that may be discovered in the future would be protected.

Water Quality and Fisheries

Riparian Management Areas

Forest Plan Standards and Guidelines direct the design of Riparian Management Areas (RMAs) associated with each stream in the project area. The Standards and Guidelines prohibit programmed commercial timber harvest in RMAs associated with all Class I, Class II, and most Class III streams, except for right-of-way clearing for road construction. Site-specific adjustments to guidelines may be made only after a detailed watershed analysis and a determination that adjustments are consistent with the Forest Plan objectives for each stream channel type.

RMAs vary in width from the edge of the stream channel according to channel type (Table B-1) and stream value class (Table B-2). All Class I and Class II streams are protected from commercial timber harvest within a minimum horizontal distance of 100 feet from the bankfull margins. Depending on the channel type, RMA widths can be up to 140 feet wide on either side of some Class I, Class II, and Class III streams. RMAs adjacent to Class III streams are protected from commercial timber harvest, except along palustrine channel types. RMA widths on Class III streams are topographically delineated along channel types with steep side-slopes and are measured to set distances along other channel types.

Unit card maps show the location of all streams, numbered for reference, and the associated RMAs. RMA widths for each Class I, Class II, and Class III stream are prescribed in the unit card narratives. Unit card narratives also prescribe the location and width of windfirm buffers for protecting RMAs, except where windthrow potential is low.

Logging System Controls

Log yarding practices are based on slope stability, soil disturbance, channel type, and stream class. Additional measures are taken to protect RMAs from possible disturbance associated with tree felling and yarding. Harvest activities near Class I, Class II, and Class III streams require that trees be felled away from the stream and that trees yarded across or along stream courses be fully suspended to minimize the exposure of mineral soil. Trees near Class IV streams are felled away from the stream whenever feasible and logging debris introduced into Class IV streams is removed. Class IV streams are treated as part of the hillside, under slope stability standards and guidelines. The objective is to minimize soil erosion, mass movement, and formation of new channels.

Best Management Practices

The following Best Management Practices (BMPs) would be applied in order to protect water quality in the project area as specified in the Forest Plan (pages C-1 to C-3). The BMPs are cited on the Unit Cards where appropriate. Not all BMPs apply to every situation.

BMP 12.6 (Riparian Area Designation and Protection) – To identify riparian areas and their associated management activities.

BMP 12.6a (Buffer Design and Layout) – To design streamside buffers to meet objectives defined during the implementation of BMP 12.6.

BMP 12.17 (Revegetation of Disturbed Areas) – To provide ground cover to minimize soil erosion.

BMP 13.5 (Identification and Avoidance of Unstable Areas) – To avoid triggering mass movements and resultant erosion and sedimentation by excluding unstable areas from timber harvest.

BMP 13.9 (Determining Guidelines for Yarding Operations) – To select appropriate yarding systems and guidelines for protecting soil and water resources.

BMP 13.16 (Stream Channel Protection – Implementation and Enforcement) – To provide the site-specific stream protection prescriptions consistent with objectives identified under BMPs 12.6 and 12.6a. Objectives may include the following:

- Maintain the natural flow regime.
- Provide for unobstructed passage of storm flows.
- Maintain integrity of the riparian buffer to filter sediment and other pollutants.
- Restore the natural course of any stream that has been diverted as soon as practicable.
- Maintain natural channel integrity to protect aquatic habitat and other beneficial uses.
- Prevent adverse changes to the natural stream temperature regime.

BMP 14.1 (Transportation Planning) – To assure soil and water resources are considered in transportation planning activities.

BMP 14.2 (Location of Transportation Facilities) – To assure water resources protection measures are considered when locating roads and trails.

BMP 14.3 (Design of Transportation Facilities) – To incorporate site-specific soil and water resource protection measures into the design of roads and trails.

BMP 14.5 (Road and Trail Erosion Control Plan) – Develop erosion control plans for road or trail projects to minimize or mitigate erosion sedimentation and resulting water quality degradation prior to the initiation of construction and maintenance activities. Ensure compliance through effective contract administration and timely implementation of erosion control measures.

BMP 14.6 (Timing Restrictions for Construction Activities) – Minimize erosion potential by restricting the operating schedule and conducting operations during lower risk periods.

BMP 14.7 (Measures to Minimize Mass Failures) – Minimize the chance and extent of road-related mass failures, including landslides and embankment slumps.

BMP 14.8 (Measures to Minimize Surface Erosion) – Minimize the erosion from cutslopes, fillslopes, and the road surface, and consequently reduce the risk of sediment production.

BMP 14.9 (Drainage Control to Minimize Erosion and Sedimentation) – Minimize the erosive effects of concentrated water flows from transportation facilities and the resulting degradation of water quality through proper design and construction of drainage control systems.

BMP 14.10 (Pioneer Road Construction) – Minimize sediment production associated with pioneer road construction.

BMP 14.11 (Timely Erosion Control Measures for Incomplete Projects) – Minimize erosion of and sedimentation from disturbed ground on incomplete projects by completing erosion control work prior to seasonal or extended shutdowns.

BMP 14.12 (Control of Excavation and Sidecast Material) – Minimize sedimentation from unconsolidated excavated and sidecast material caused by road construction, reconstruction, or maintenance.

BMP 14.14 (Control of In-channel Operations) – Minimize stream channel disturbances and related sediment production.

BMP 14.15 (Diversion of Flows Around Construction Sites) – Identify and implement diversion and de-watering requirements at construction sites to protect water quality and downstream uses.

BMP 14.17 (Bridge and Culvert Design and Installation) – Minimize adverse impacts on water quality, stream courses, and fisheries resources from the installation of bridges, culverts, or other stream crossings.

BMP 14.20 (Road Maintenance) – Maintain all roads in a manner which provides for soil and water resources protection by minimizing rutting, road prism failures, sidecasting, and blockage of drainage facilities.

BMP 14.22 (Access and Travel Management) – Control access and manage road use to reduce the risk of erosion and sedimentation from road surface disturbance especially during the higher risk periods associated with high runoff and spring thaw conditions.

Process Groups and Channel Types (Forest Plan, page D-3)

The Tongass National Forest defines stream channel types according to the Channel Type User Guide (USDA Forest Service, 1992), the foundation upon which aquatic habitat management prescriptions are developed. Channel types are defined within the context of fluvial process groups that describe the interrelationship between watershed runoff, landform relief, geology, and glacial or tidal influences on fluvial erosion and deposition processes. Individual channel type classifications are defined by physical attributes such as channel gradient, channel width, channel pattern, stream bank incision and containment. Table B-1 shows the Forest Plan codes used on the unit card narratives. See the Forest Plan, Figure D-1 (page D-4) for a visual representation of the typical distribution of channel process groups. Each unit card summarizes the protection for a particular unit. Only the channel types found in proposed timber harvest units are listed.

Table B-1. Channel Types in or adjacent to proposed harvest units

Process Group	Channel Type Code	Channel Type Description
High Gradient Contained	HC2	Shallowly to Moderately Incised Footslope Channel
	HC3	Deeply Incised Upper Valley Channel
	HC5	Shallowly Incised Very High Gradient Channel
	HC6	Deeply Incised Mountain Slope Channel
Moderate Gradient Contained	MC2	Moderate Width and Incision Contained Channel
Moderate Gradient Mixed Control	MM1	Narrow Mixed Control Channel
	MM2	Moderate Width Mixed Control Channel

Table B-2. Stream Value Classes

Stream Value Class	Criteria
Class I	Streams and lakes with anadromous or adfluvial fish or fish habitat; or high quality resident fish waters, or habitat above fish migration barriers known to be reasonable enhancement opportunities for anadromous fish.
Class II	Streams and lakes with resident fish or fish habitat and generally steep (6-25 percent or higher) gradient (can also include streams with a 0-6 percent gradient) where no anadromous fish occur, and otherwise not meeting Class I criteria
Class III	Streams are perennial and intermittent streams that have no fish populations or fish habitat, but have sufficient flow or sediment and debris transport to directly influence downstream water quality or fish habitat capability. For streams less than 30 percent gradient, special care is needed to determine if resident fish are present.
Class IV	Other intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to have immediate influence on downstream water quality or fish habitat capability. Class IV streams do not have the characteristics of Class I, II, or III streams and have a bankfull width of at least 0.3 meter (1 foot).

Scenery

The following Visual Quality Objectives from the Forest Plan provide standards for management based on the landscape's scenic characteristics and public viewing concern.

Retention: Changes in the landscape are not visually evident to the average forest visitor.

Partial Retention: Changes in the landscape may be evident to the casual observer but appear as natural occurrences when contrasted with the appearance to the surrounding landscape.

Modification: Changes in the landscape appear very evident but incorporate natural patterns of form, line, color, and texture when contrasted with the appearance of the surrounding landscape.

Maximum Modification: Changes in the landscape appear highly evident and may visually dominate the surrounding landscape, yet when viewed in the background distance these activities appear as natural occurrences.

Scenery Standards and Guidelines

The VQOs within the Kuiu Timber Sale Area include Maximum Modification and Modification for the Timber Production LUD, Retention for the Old-growth Habitat LUD, and Partial Retention within the Recreational River LUD within the ¼-mile corridor of Kadake Creek (see the Scenery section of Chapter 3).

Measures taken to minimize the potential effects on scenery from timber harvest for this project were limited to the design of Units 414 and 415 within the Kadake Creek Recreational River corridor using a harvest method of 50 percent basal area retention.

Heritage Resources

Archaeologists have intensively surveyed areas considered to have a high probability of containing heritage resources. Some areas outside the high probability zone and within the area of influence were surveyed to test the heritage resources predictive model. All identified heritage resources are not in the vicinity of the proposed timber harvest and temporary roads. The Forest Service has made a determination of no effect and has received concurrence from the Alaska State Historic Preservation Officer for all proposed activities.

Karst

There is karst found within the project area. There are no units nor any road building proposed within the known karst areas. There are no active mining claims found in the project area.

Lands and Special Uses

Lands within the project area include 45,746 acres of National Forest system lands and 356 acres of lands of non-National Forest System lands. Special use permit outfitter/guide operations have been authorized to conduct activities in the Kuiu Timber Sale Area.

Wetlands

There are some areas of forested wetlands and muskeg/forested wetland mosaics within the proposed harvest units. Both wetland types are classed as suitable for timber production in the Forest Plan. There are no other wetland types within harvest unit boundaries.

Logging Economics

Helicopter logging costs are higher for smaller diameter trees compared to larger diameter trees since it takes more helicopter time to log the equivalent volume of smaller trees. Due to current market conditions, the cost of removing this lower value material frequently exceeds its selling value. In all helicopter units, trees that are 16" DBH or less and hemlock greater than 36 inches DBH will be left standing where they would not create safety concerns during logging.

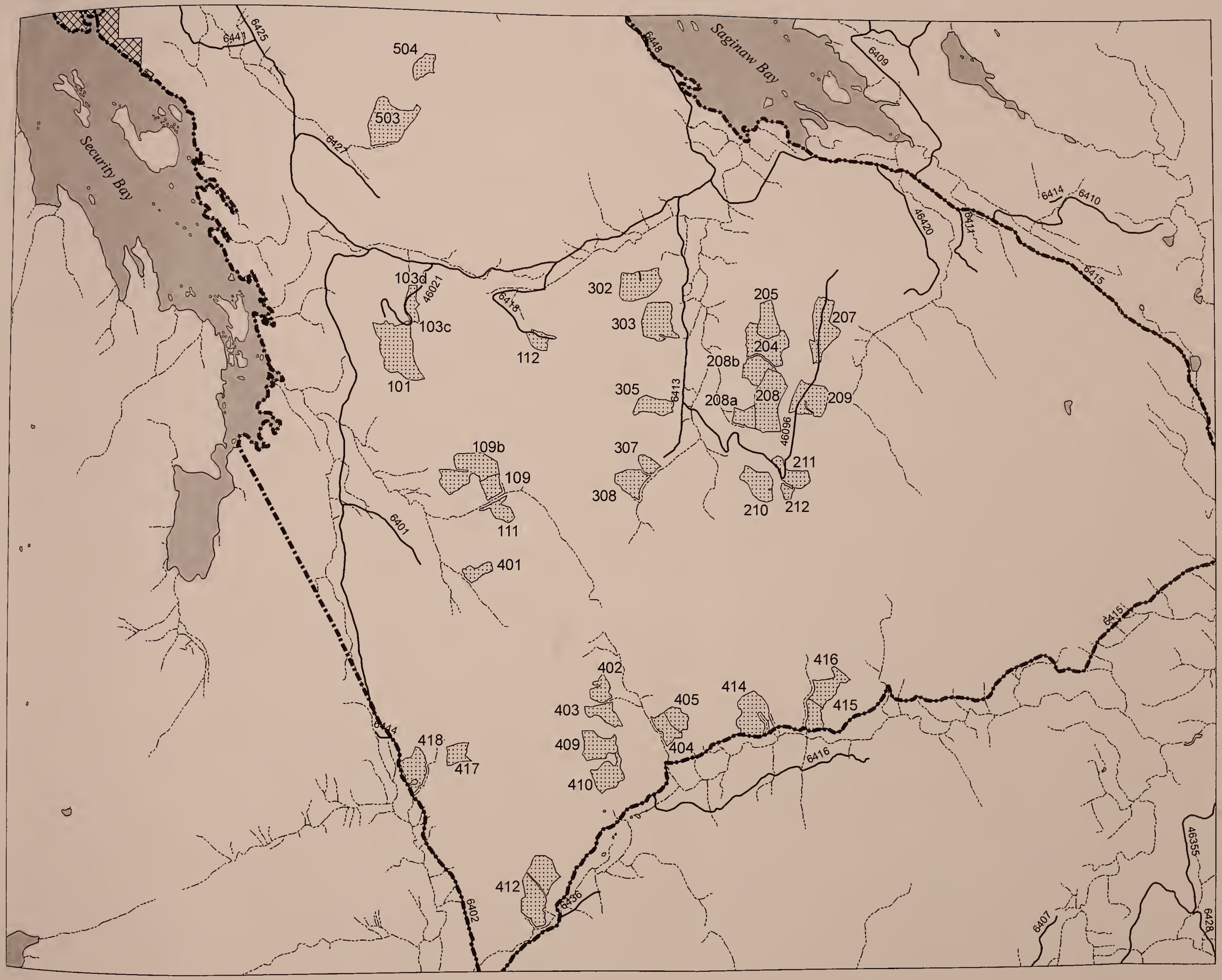
Yarding costs could increase as much as 60 percent in cable units where retained trees are left scattered throughout the unit instead of in clumps along split lines and boundaries. This increased cost associated with the need to utilize lateral yarding to protect residual trees, results in increased set-up times.

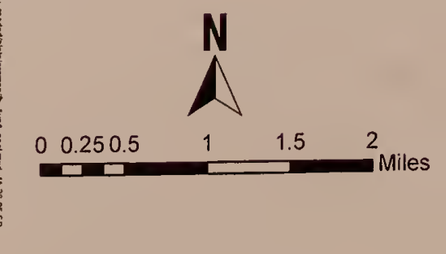
Kuiu Timber Sale

Figure B-1
Unit Pool

Legend

- Unit Pool
- Non-National Forest
- Lakes/Saltwater
- Project Area Boundary
- Existing Open Roads
- Stream Value Class I & II





cwo/respace/kiuu_modeled/photo/arcmap/fs_kiuu_pool.mxd 11-26-05 EP

Unit Cards

Kuiu Timber Sale Unit Card

Unit Number:	101	**Unit Acres:**	98	**Alternatives:**	4, 5
1999 Aerial Photo:	198_106, 198_107	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	2,633 MBF
TM-Compartment and Stand:	2-121	**Volume Strata Acres:**	High 86 Medium 5 Low Non-forest		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat / Watershed

Concern: Streams 1 and 4 are Class III, channel type HC5.
Streams 2, 3, and 5-7 are Class IV, channel type HC5.

Response: Streams 1 and 4: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a., 13.9, and 13.16.
Streams 2, 3, and 5-7: Split yard away from class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 13.9, and 13.16.

Soils

Concern: Steep areas along majority of western boundary of the unit and at the bottom southeast section of unit. 11 Acres MMI- 4, soil investigation found no signs of windthrow or landslide instability.

Response: Western boundary and temporary road relocated to exclude areas of greatest concern. Require partial suspension of logs. Avoid harvest in the southeast section where MMI-4 slopes exist. Do not yard across streams 7 and 8.

Wildlife/Biological Diversity

Concern: Large amount of high Volstrata present in unit. Red squirrel and black bear use reported in unit. 35 acres of medium (HSI 0.40 to 0.50) deer habitat value occurs in this unit. 78 acres of high value marten (HSI >0.89) habitat occurs within unit.

Response: Harvest would not isolate habitat by removing corridors linking low elevation habitat to high elevations.

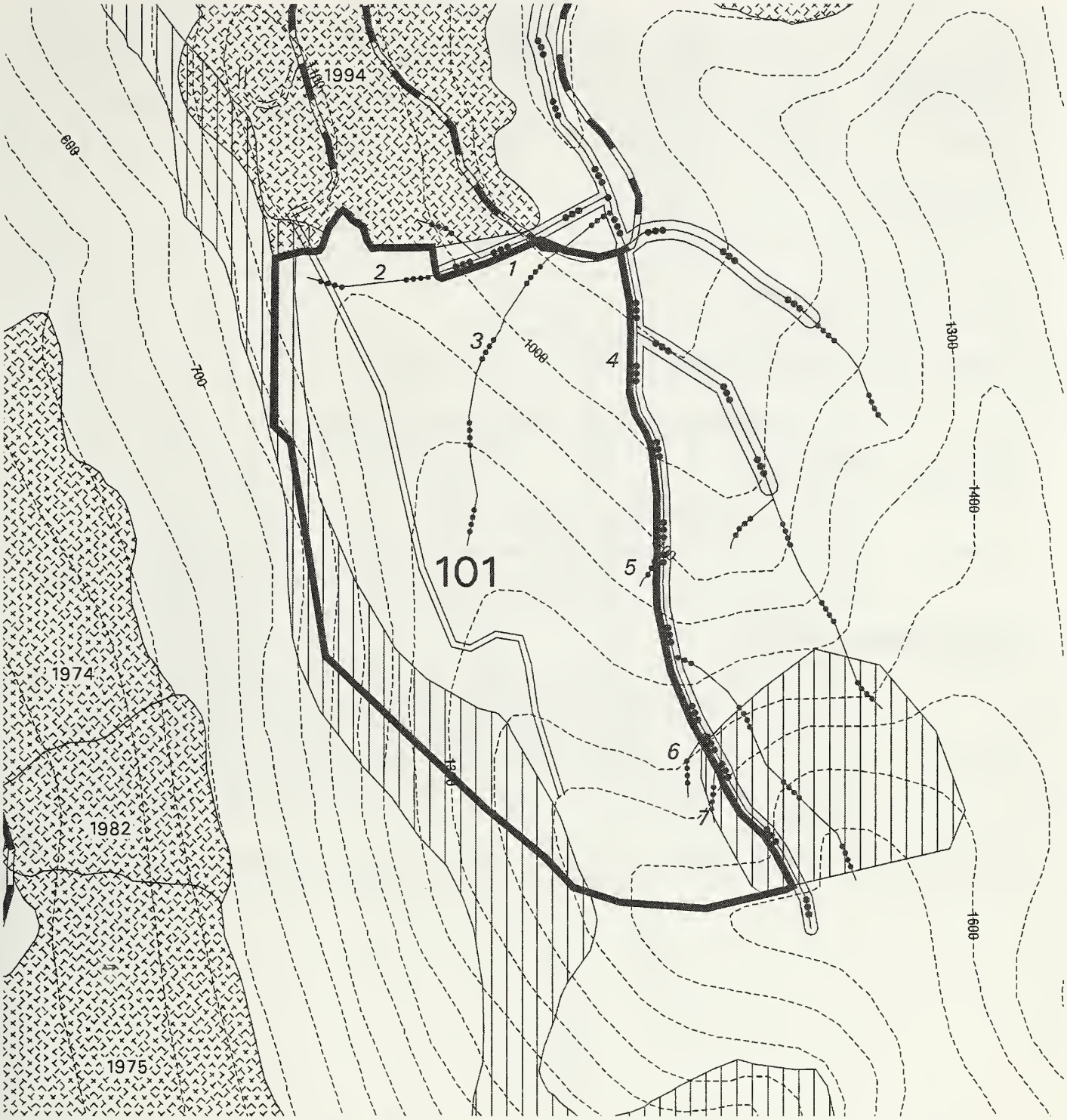
Vegetation/Timber

Concern: Even-aged opening size is close to 100 acres.

Response: During layout ensure harvest unit does not exceed 100 acres.

No resource concerns for: Scenery, Karst, Wetlands, Heritage

Kuiu Unit 101 Alternative 4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 101 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	103c	**Unit Acres:**	20	**Alternatives:**	2
1999 Aerial Photo:	198_106, 198_107	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	503 MBF
TM-Compartment and Stand:	2-133	**Volume Strata Acres:**	High 17 Medium 1 Low 0 Nonforest 2		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / Use existing Road 46021

Resource Concerns & Responses

Fish Habitat / Watershed

Concern: Stream 1 is Class III, Channel Type HC5.
Stream 2 is Class III, Channel Type HC2.

Response: Streams 1 and 2: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a., 13.9, and 13.16.

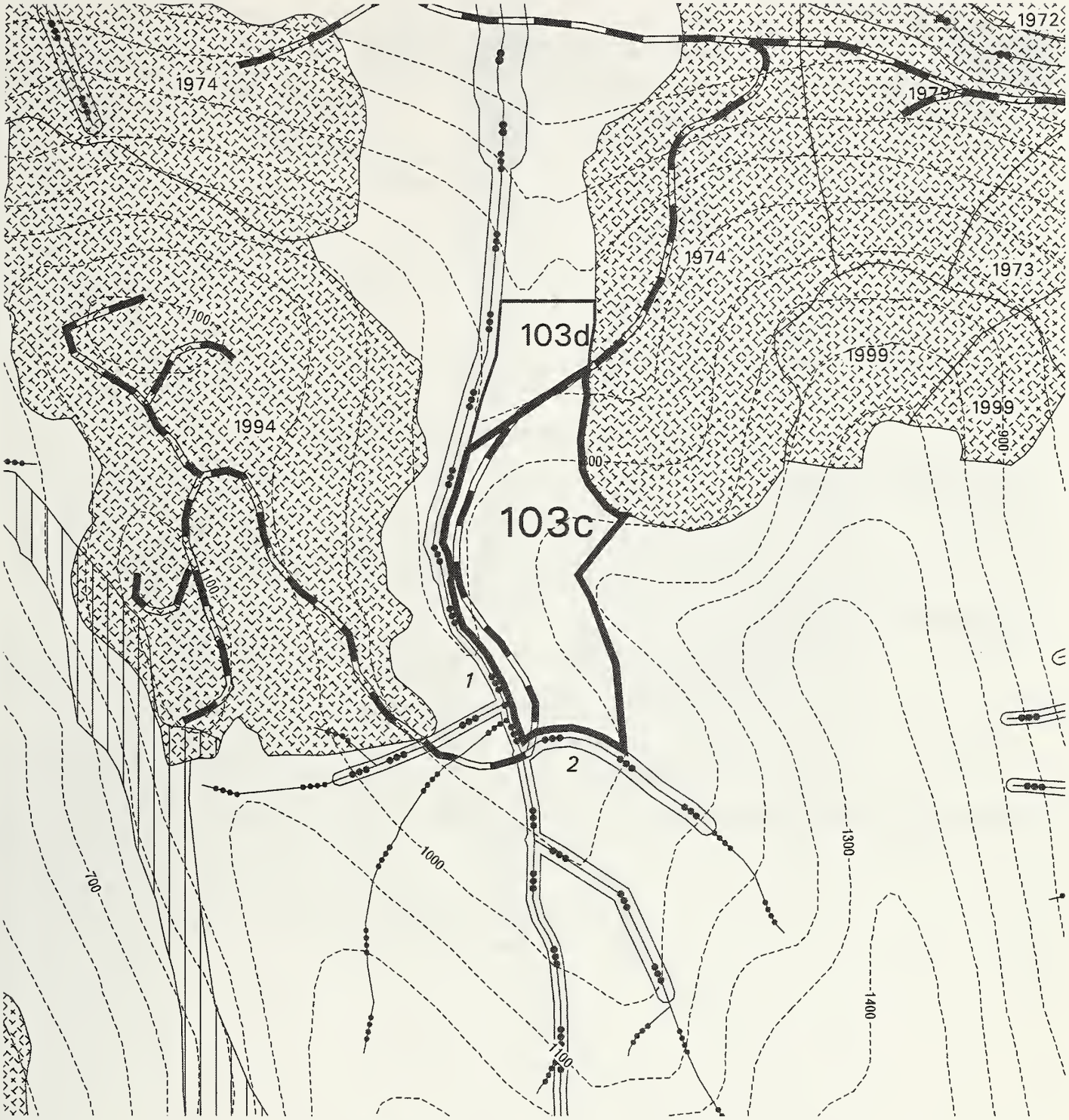
Wildlife/Biological Diversity

Concern: Small unit size but large amount of high Volstrata within the unit. Less than one acre of high (HSI > 0.60), 15 acres of medium (HSI 0.40 to 0.50) deer habitat value occurs within this unit. 17 acres of high value marten (HSI >0.89) habitat occurs within this unit.

Response: Clearcut prescription would remove all high Volstrata when unit is harvested. Harvest would not isolate habitat and no corridors linking low to high elevations would be harvested.

No resource concerns for: Scenery, Soils, Karst, Wetlands, Heritage, Vegetation

Kuiu Unit 103c Alternative 2



Existing Managed Stands
Riparian Management Area
Forest Plan Old-Growth Reserve
Extreme Hazard Soils
High Hazard Soils
Proposed Unit 103c Boundary
Adjacent Proposed Units
Stream Value Class I
Stream Value Class II
Stream Value Class III
Stream Value Class IV

Existing Open Roads
Closed Roads (Storage)
Decomissioned Roads
Proposed Roads
100-ft. Contour Interval

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	103d	**Unit Acres:**	5	**Alternatives:**	2
1999 Aerial Photo:	198_106, 198_107	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	141 MBF
TM-Compartment and Stand:	2-123	**Volume Strata Acres:**	High 5 Medium Low Non-forest		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / Use existing Road 46021

Resource Concerns & Responses

Fish Habitat / Watershed

Concern: Stream 1 is Class III, Channel Type HC5.

Response: Stream 1: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a., 13.9, and 13.16.

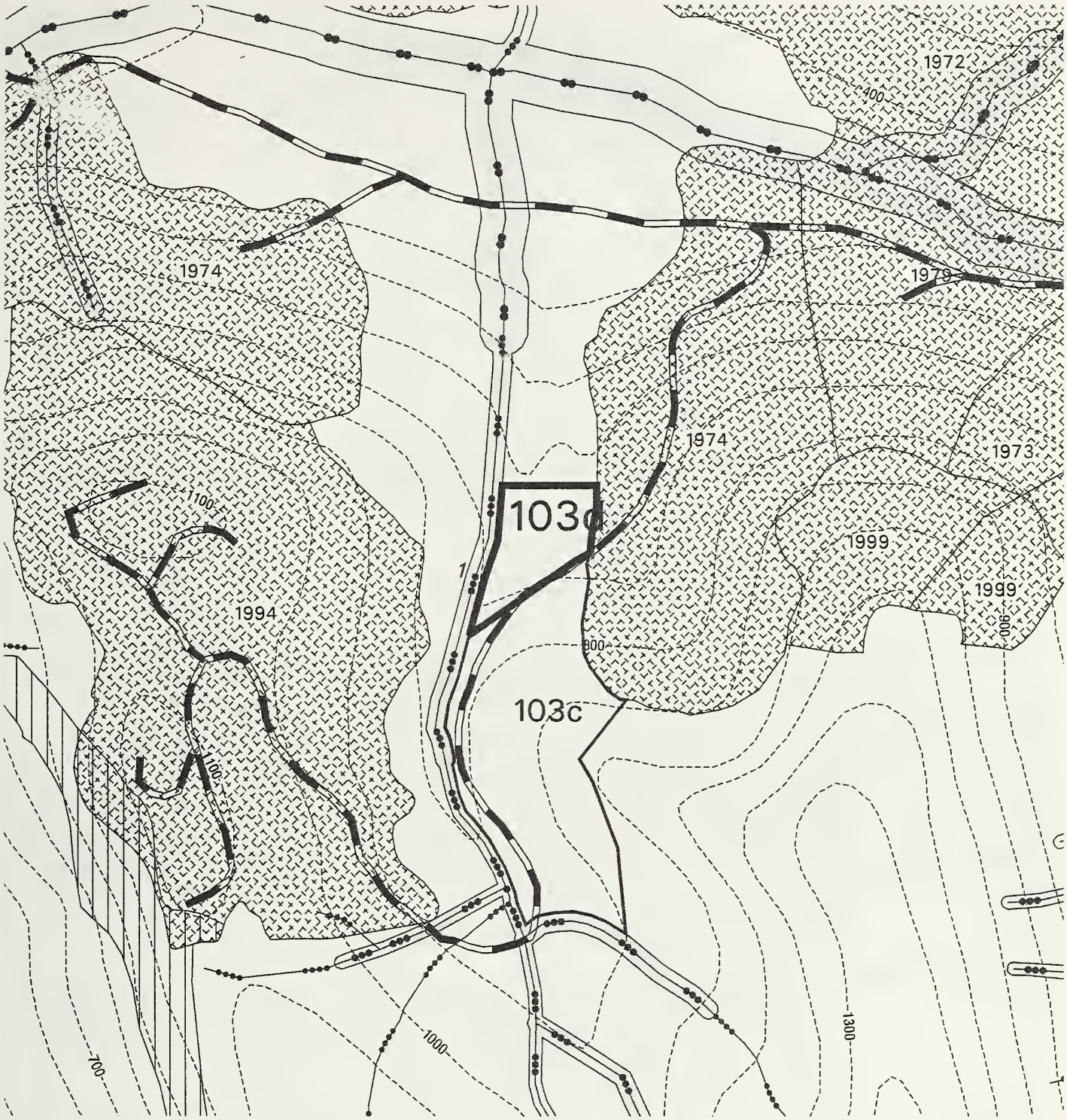
Wildlife/Biological Diversity

Concern: Small unit, large amount of high Volstrata within unit. One acre of high (HSI > 0.60), 4 acres of medium (HSI 0.40 to 0.50) deer habitat value occurs within this unit. 5 acres of high value marten (HSI >0.89) habitat value occurs within this unit.

Response: Clearcut prescription would remove all high Volstrata when unit is harvested. Harvest would not isolate habitat and no corridors will be removed linking low to high elevations.

No resource concerns for: Scenery, Soils, Karst, Wetlands, Heritage, Vegetation

Kuiu Unit 103d Alternative 2



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 103d Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	1[illegible]	**Unit Acres:**	100	**Alternatives**	3, 4, 5
1999 Aerial Photo:	1[illegible] 74, 19[illegible] 75	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	1,379 MBF Alt 3 2,766 MBF Alt 4 & 5
TM-Compartment and Stand:	2-125	**Volume Strata Acres:**	High 79 Medium 14 Low 7 Nonforest 0		

Existing Stand Condition: Understory reinitiation
Silvicultural Prescription: **Alt. 3** Two-aged management, 50% BA retention, clearcut with reserves, 52 acres and even-aged management, clearcut, 48 acres.
Alt. 4 and 5 Even-aged management, clearcut, 100 acres.
Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat / Watershed

Concern: Stream 1 is Class I, Channel Type MM2.
Stream 2 is Class II, Channel Type HC3.
Stream 3 is Class III, Channel Type HC3
Streams 4 and 5 are Class IV, Channel Type HC5.
Stream 6 is Class III, Channel Type HC5.

Response: Stream 1: No programmed commercial timber harvest in the RMA, which is defined as the greatest of the flood plain, riparian vegetation or soils, riparian associated wetland fens, or 120 feet. Provide reasonable assurance of windfirmness of the riparian management area.
Stream 2: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area.
Streams 3 and 6: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area.
Streams 4 and 5: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities.
All Streams: Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Wildlife/Biological Diversity

Concern: Large amount of high and medium Volstrata present in unit. 39 acres of high value deer (HSI >0.60), 53 acres of medium value (HSI 0.40 to 0.50) deer habitat and 79 acres of high value marten (HSI >0.89) habitat occurs within this unit. Unit is potentially a travel corridor for animals from high elevation to low elevation.

Response: Alternatives 4 and 5 prescribe clearcut harvest. This prescription would reduce habitat value and create large area of second growth. It would remove travel corridor between high elevation and low elevation and would isolate some higher elevation habitat. Alternative 3 prescribes uneven-aged management, which would mitigate removal of travel corridor for all but 48 acres within this unit.

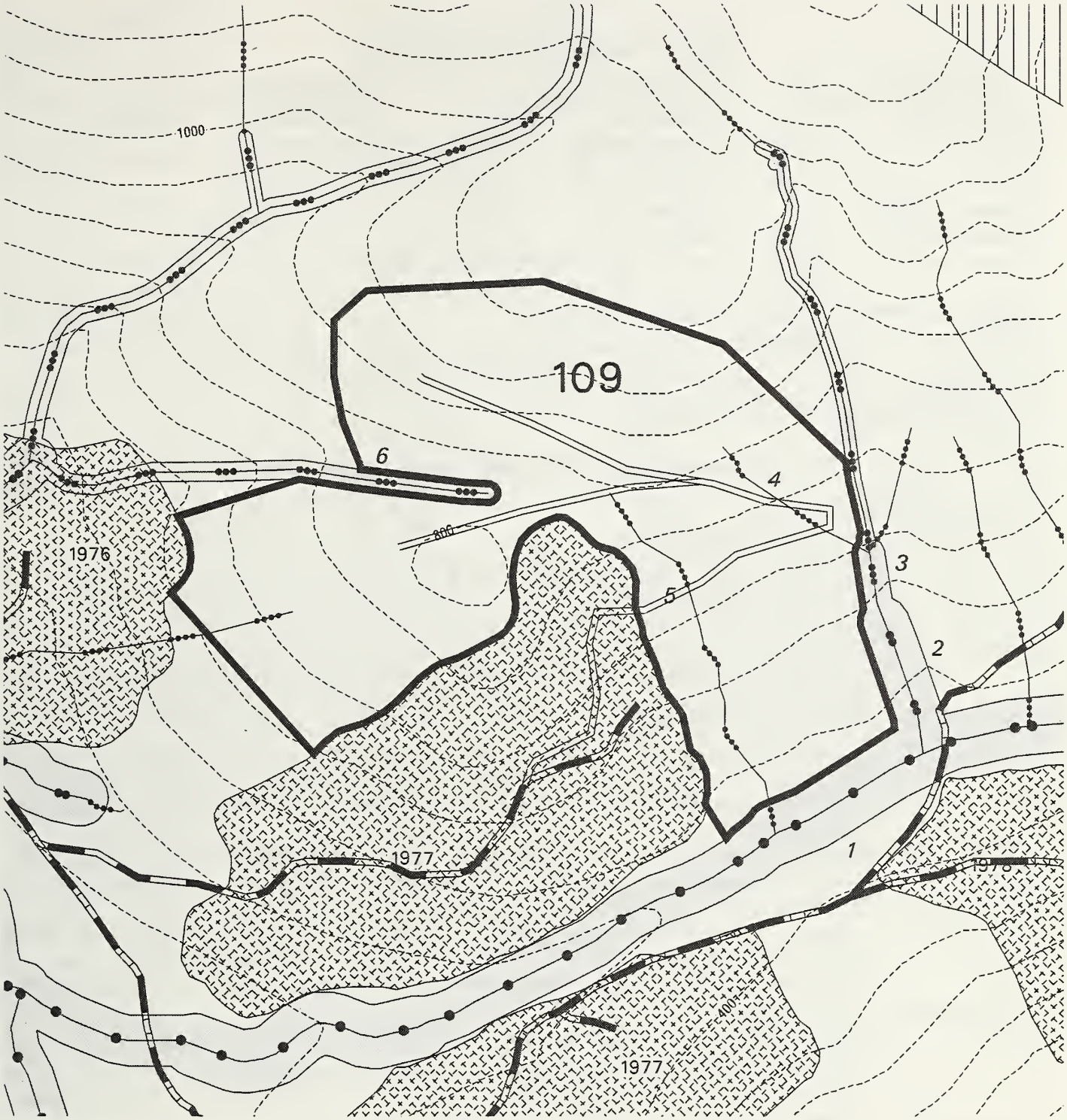
Vegetation/Timber

Concern: Even-aged opening size is close to 100 acres.

Response: During layout ensure harvest unit does not exceed 100 acres.

No resource concerns for: Scenery, Soils, Karst, Wetlands, Heritage

Kuiu Unit 109 Alternative 3,4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 109 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	109b	**Unit Acres:**	17	**Alternatives:**	2
1999 Aerial Photo:	198_74, 198_75	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	200 MBF
TM-Compartment and Stand:	2-125	**Volume Strata Acres:**	High 6 Medium 7 Low 4 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Two-Aged management clearcut with reserves-50% BA retention above road, Uneven-aged management - Single Tree Selection -50% BA retention below the road.

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat / Watershed

Concern: Stream 1 is Class I, Channel Type MM2.
Stream 2 is Class II, Channel Type HC3.
Stream 3 is Class III, Channel Type HC3
Streams 4 and 5 are Class IV, Channel Type HC5.

Response: Stream 1: No programmed commercial timber harvest in the RMA, which is defined as the greatest of the flood plain, riparian vegetation or soils, riparian associated wetland fens, or 120 feet. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 2: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 3: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Streams 4 and 5: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

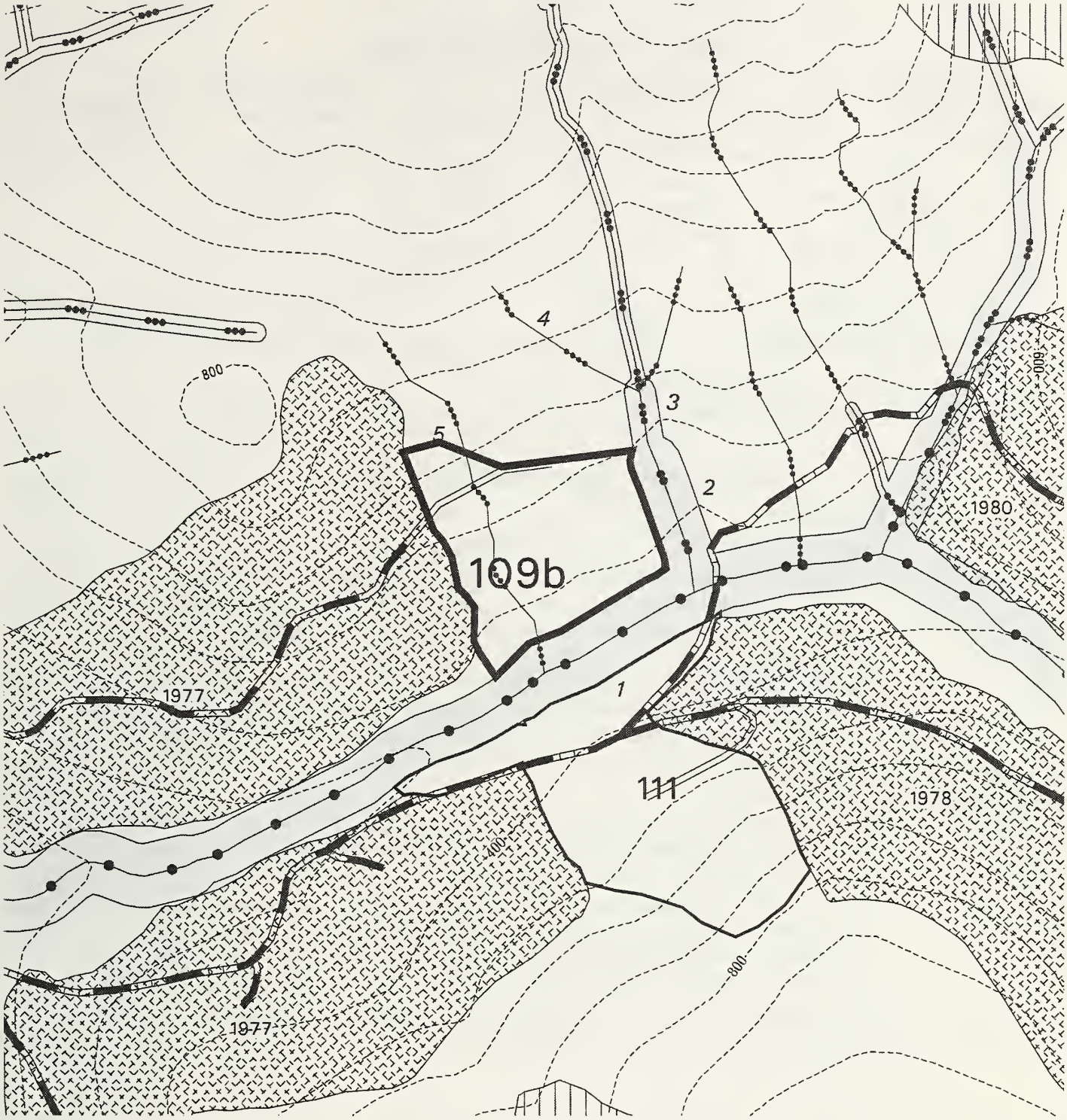
Wildlife/Biological Diversity

Concern: High Volstrata present in unit. 5 acres high value (HSI >0.60), 7 acres of medium value (HSI 0.4 to 0.5) deer habitat occurs within this unit. 5 acres high value marten (HSI >0.89) habitat occurs within this unit. Area is a potential travel corridor from high elevation habitat to low elevation habitat.

Response: 50% basal area retention and small size of the unit would mitigate impacts to potential animal use. This treatment would reduce travel corridor between high elevation and low elevation but would not isolate higher elevation habitat because of prescription.

No resource concerns for: Scenery, Soils, Karst, Wetlands, Heritage, Vegetation

Kuiu Unit 109b Alternative 2



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 109b Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	111	**Unit Acres:**	24	**Alternatives:**	2, 4, 5
1999 Aerial Photo:	198_74, 298_127	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	315 MBF Alt 2 631 MBF Alt 4 & 5
TM-Compartment and Stand:	2-126	**Volume Strata Acres:**	High 8 Medium 16 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Alt. 2 Two Aged Management-50% BA retention, clearcut with reserves

Alt. 4 and Alt 5 Even-aged management, clearcut, 24 acres

Logging Method/ Transportation: Cable / One temporary road and existing Road 6443

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class I, Channel Type MC2/MM1.

Response: Stream 1, MC2 section: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the channel, or to the top of the side-slope break, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a., 13.9, and 13.16.
Stream 1 MM1 section: No programmed commercial timber harvest in the RMA, which is defined as the greatest of the flood plain, riparian vegetation or soils, riparian associated wetland fens, or 120 feet. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a., 13.9, and 13.16.

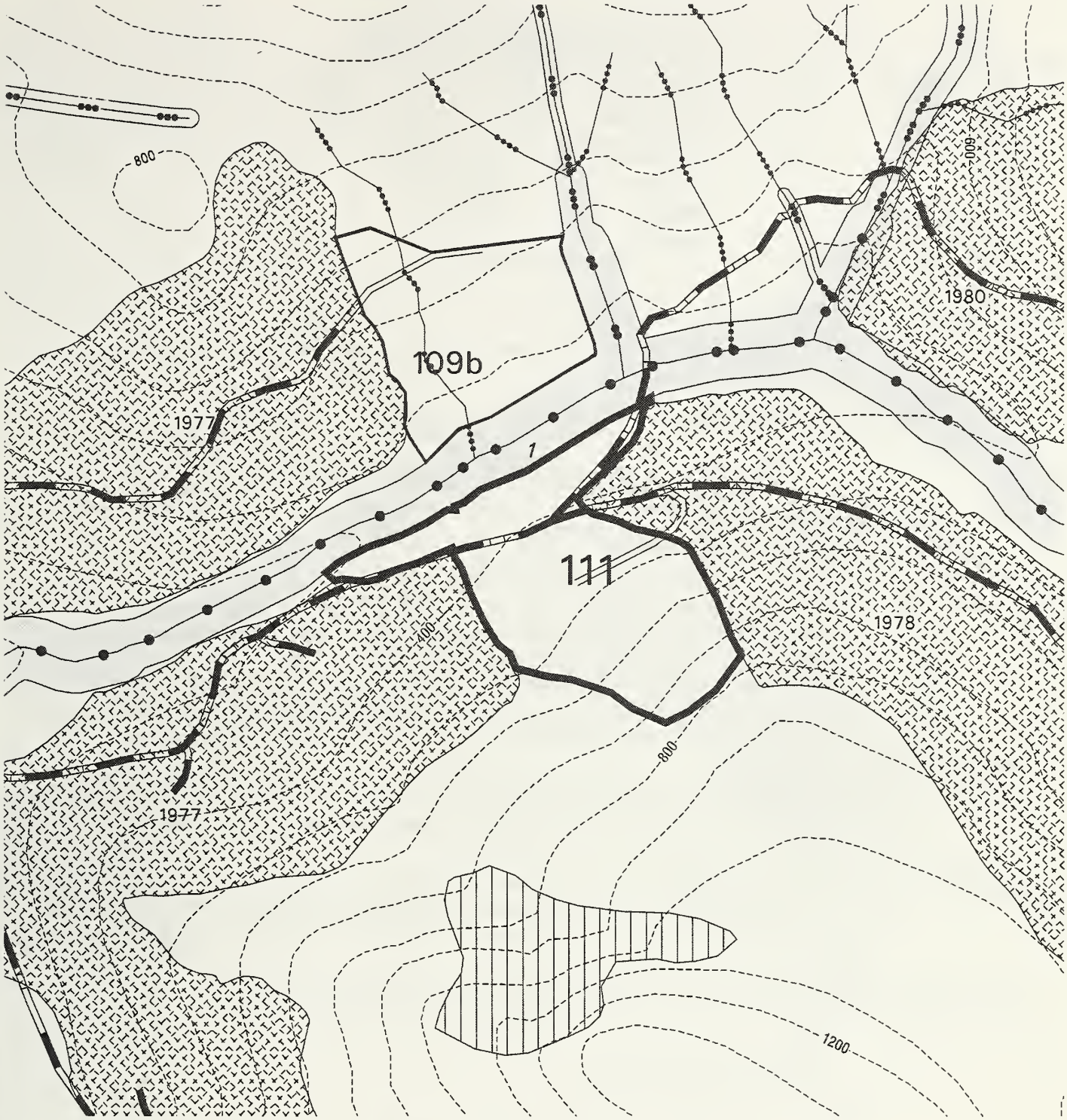
Wildlife/Biological Diversity

Concern: Only high and medium Volstrata present. This area was identified as a wildlife corridor by the IDT. 8 acres of medium value (HSI 0.40 to 0.50) deer habitat and 8 acres of high value marten (HSI >0.89) habitat are within this unit.

Response: Uneven-aged management and small size of the unit in Alt 2 would mitigate potential impacts to animal habitat. Alts 4 & 5 would reduce habitat value and create a large area of second growth. Alternative 2 would maintain travel corridor between high elevation and low elevation. Alternatives 4 and 5 would remove this corridor link between high and low elevations.

No resource concerns for: Scenery, Soils, Karst, Wetlands, Heritage, Vegetation

Kuiu Unit 111 Alternative 2,4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 111 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	112	**Unit Acres:**	22	**Alternatives:**	3, 4, 5
1999 Aerial Photo:	198_77, 298_124	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	316 MBF Alt 3 632 Alt 4 & 5
TM-Compartment and Stand:	3-126	**Volume Strata Acres:**	High 22 Medium 0 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Alt. 3 Two-aged management-50% BA retention, clearcut with reserves

Alt. 4, 5 Even-aged management, clearcut.

Logging Method/ Transportation: Cable / Use existing Road 6418

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class III, Channel Type HC3.
Streams 2 and 3 are Class IV, Channel Type HC5.

Response: Stream 1: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Streams 2 and 3: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

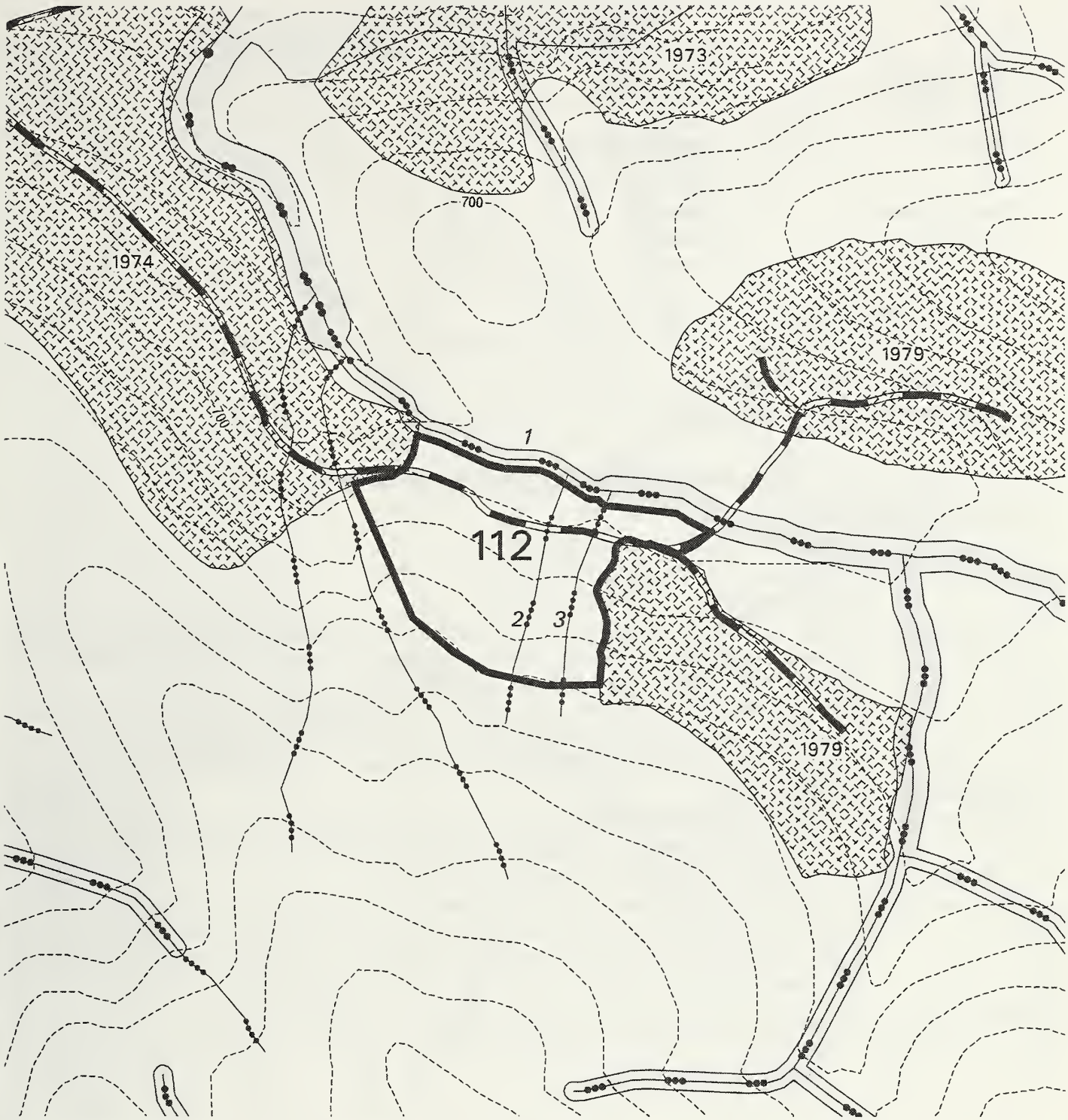
Wildlife/Biological Diversity

Concern: Deer, bear and cavity nesting use, only high Volstrata present in unit. 14 acres of medium value (HSI 0.40 to 0.50) deer habitat and 22 acres of high value marten (HSI >0.89) habitat are within this unit.

Response: Two-aged management in Alt 3 and small size of unit would mitigate impacts. Alts 4 & 5 would reduce habitat value and created large area of second growth. Alternative 3 would maintain a travel corridor between high elevation and low elevation. Alternatives 4 and 5 would remove the corridor.

No resource concerns for: Scenery, Soils, Wetlands, Karst, Heritage, Vegetation

Kuiu Unit 112 Alternative 3,4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 112 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	204	**Unit Acres:**	69	**Alternatives:**	3, 5
1999 Aerial Photo:	598_130, 598_131	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	856 MBF Alt 3 1,717 MBF Alt 5
TM-Compartment and Stand:	3-127	**Volume Strata Acres:**	High 35 Medium 29 Low 0 Non-forest 5		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: **Alt. 3** Two-aged management-50% retention BA, clearcut with reserves

Alt. 5 Even-aged Management, clearcut.

Logging Method/ Transportation: Cable / Two temporary roads

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class III, Channel Type HC6
Stream 2 is Class IV, Channel Type HC5
Stream 3 is Class IV, Channel Type HC5

Response: Stream 1: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Streams 2 and 3: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

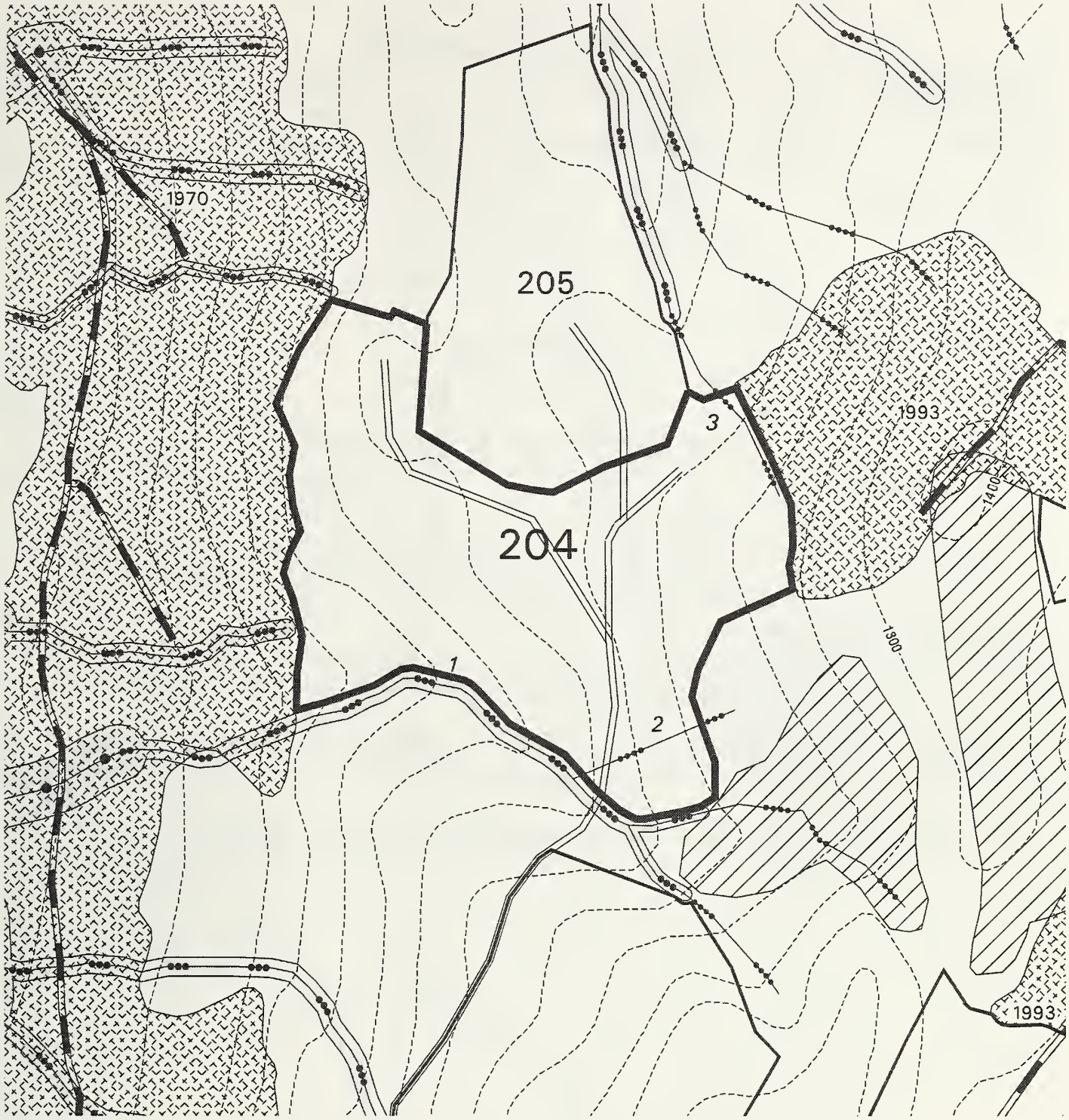
Wildlife/Biological Diversity

Concern: Large amount of high and medium Volstrata reported in this unit. 14 acres of high value (HSI >0.60), 24 acres of medium value (HSI 0.40 to 0.50) deer habitat and 35 acres of high value marten (HSI >0.89) habitat are located within this unit.

Response: Two-aged management prescriptions in Alternative 3 would mitigate the harvest of high and medium Volstrata and deer and marten habitat values within the unit. Clearcut harvest in Alt 5 would remove all old-growth habitat and reduce deer and marten habitat values. Unit is high elevation, and harvest would not isolate habitat and no corridors would be removed.

No resource concerns for: Soils, Karst, Wetlands, Scenery, Heritage, Vegetation

Kuiu Unit 204 Alternative 3,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 204 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	205	**Unit Acres:**	39	**Alternatives:**	3
1999 Aerial Photo:	598_130, 598_131	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	833 MBF
TM-Compartment and Stand:	3-128	**Volume Strata Acres:**	High 9 Medium 15 Low 12 Non-forest 3		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class III, Channel Type HC6

Response: Stream 1: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

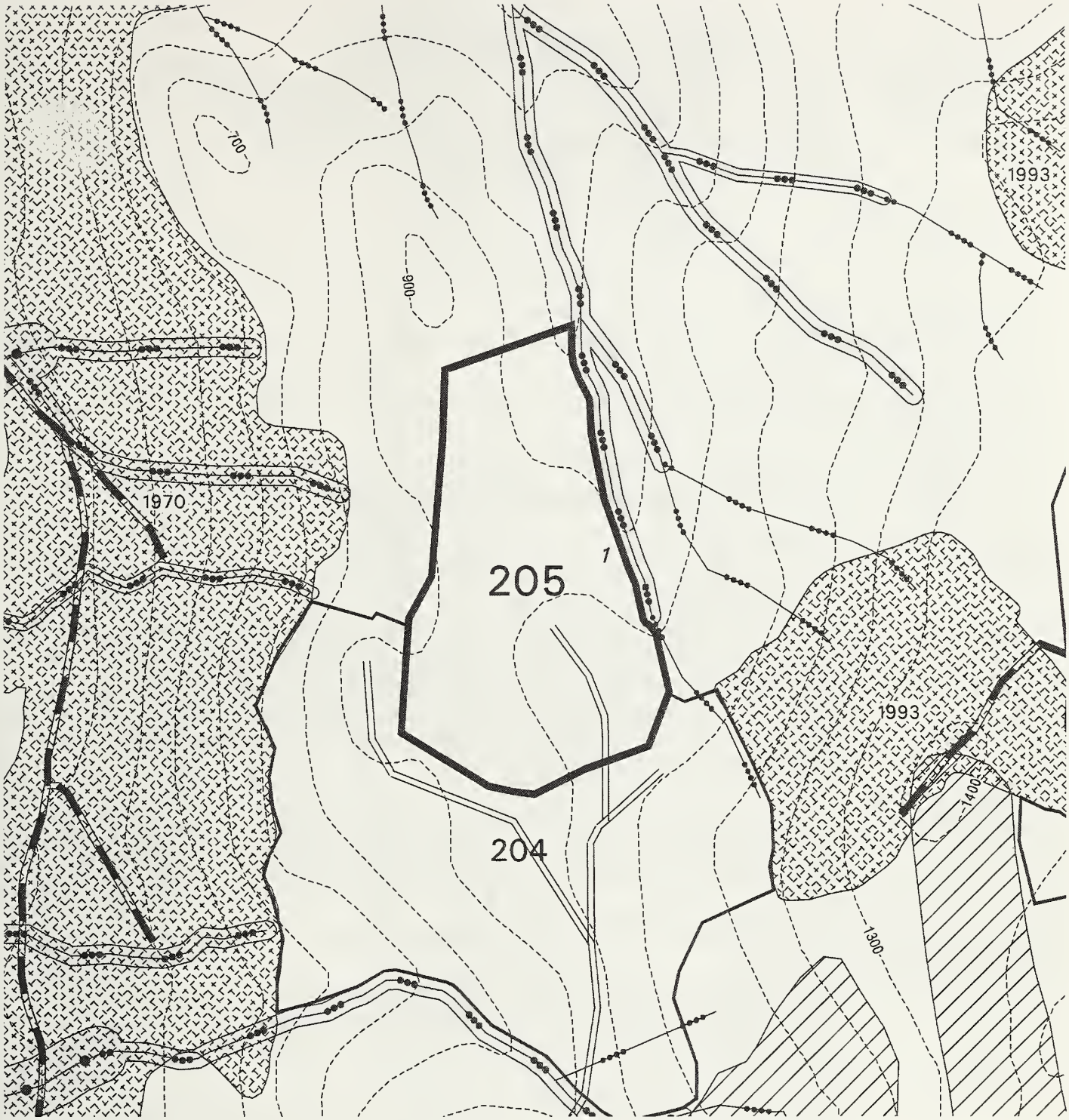
Wildlife/Biological Diversity

Concern: High, medium and low Volstrata located within unit. 1 acre of high value (HSI >0.60), 4 acres of medium value (HSI 0.40 to 0.50) deer habitat and 9 acres of high value marten (HSI >0.89) habitat are located within the unit.

Response: Clearcut harvest would remove all old-growth habitat and reduce marten and deer habitat values. Unit is in high elevation habitat and harvest would not isolate habitat and no corridors would be removed.

No resource concerns for: Soils, Karst, Wetlands, Scenery, Heritage, Vegetation

Kuiu Unit 205 Alternative 3



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 205 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	207	**Unit Acres:**	75	**Alternatives:**	2, 4
1999 Aerial Photo:	598_100, 598_101	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	1,239 MBF
TM-Compartment and Stand:	3-129	**Volume Strata Acres:**	High 72 Medium 3 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Alt. 2 Two-aged management - 50% BA retention, clearcut with reserves 65 acres, even-aged management clearcut 10 acres.

Alt. 4 Uneven-aged Management, 50% BA retention, clearcut with reserves, 65 acres and even-aged management, clearcut, 10 acres.

Logging Method/ Transportation: Cable and Shovel logging / Existing Road 46096

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Streams 1, 2, 4, 5, and 6 are Class IV, Channel Type HC5. Stream 3 is Class III, Channel Type HC6.

Response: Streams 1, 2, 4, 5, and 6: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Stream 3: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Soils

Concern: 13.7 acres of MMI-4 soils at bottom of unit. Soils investigation found no past evidence of landslides or windthrow. However, if a landslide occurs within hazardous soil areas (at bottom southeast section of unit), displaced sediment could impact high value Sedge Fen Wetland located below.

Response: Recommend partial harvest and partial suspension for unit.

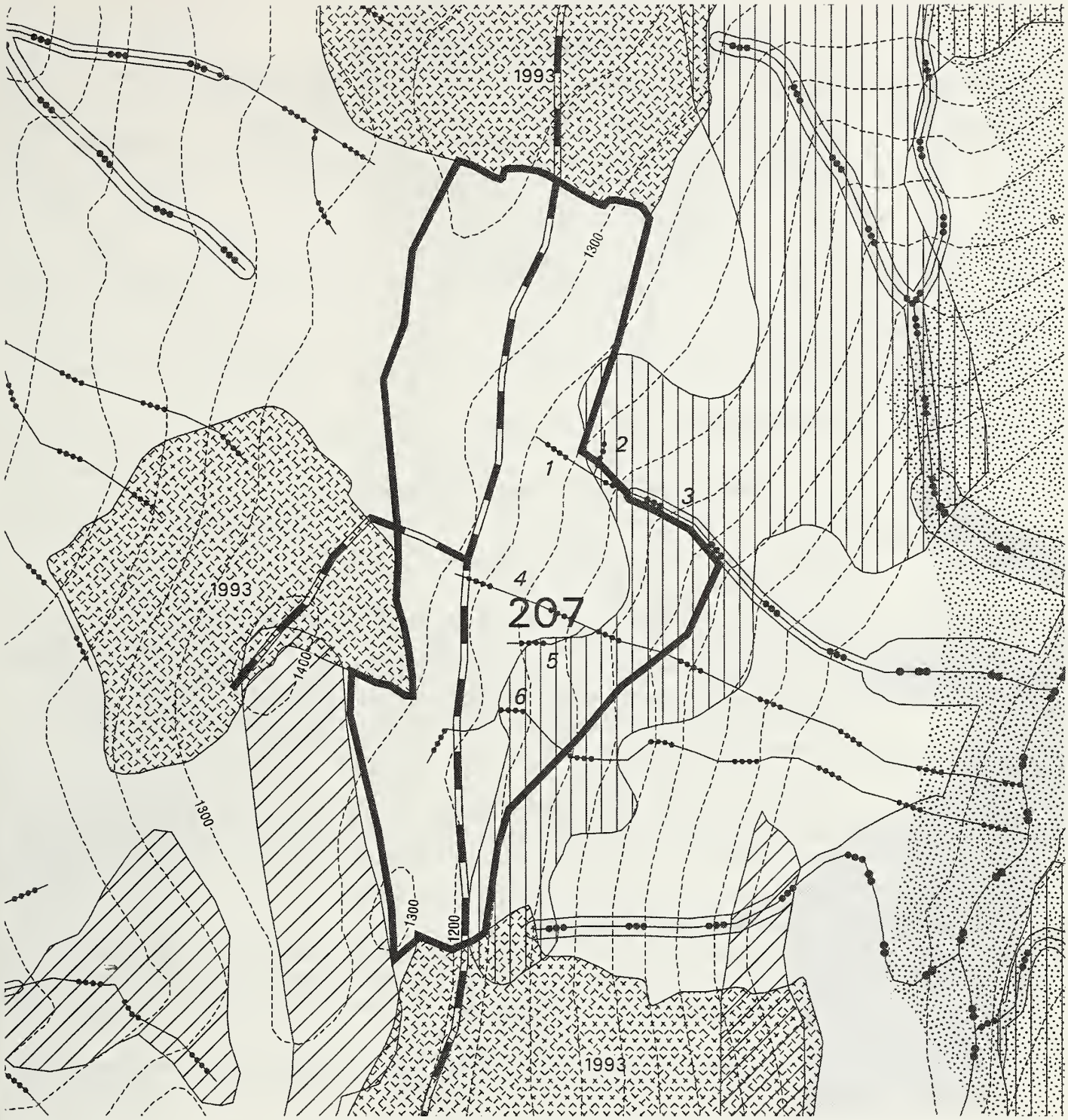
Wildlife/Biological Diversity

Concern: This prescription was designed to retain a wildlife travel corridor. A large amount of high Volstrata is located in this unit. 1 acre of high value (HSI >0.60), 12 acres of medium value (HSI 0.40 to 0.50) deer habitat and 58 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: 50% BA retention prescriptions would mitigate the harvest of high Volstrata and marten habitat values within the unit. Harvest would not isolate habitat and no corridors would be removed from low to high elevations.

No resource concerns for: Karst, Wetlands, Scenery, Heritage, Vegetation

Kuiu Unit 207 Alternative 2,4



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 207 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	207	**Unit Acres:**	60	**Alternatives:**	3
1999 Aerial Photo:	598_100, 598_101	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	918 MBF
TM-Compartment and Stand:	3-129	**Volume Strata Acres:**	High 57 Medium 3 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Two-aged management, 50% BA retention, clearcut with reserves, 57 acres and even-aged management, clearcut, 3 acres.

Logging Method/ Transportation: Cable and Shovel logging / Existing Road 46096

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Streams 1, 2, 4, 5, and 6 are Class IV, Channel Type HC5.
Stream 3 is Class III, Channel Type HC6.

Response: Streams 1, 2, 4, 5, and 6: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 3: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Soils

Concern: MMI-4 soils at bottom of unit. Soils investigation found no past evidence of landslides or windthrow. However, if a landslide occurs within hazardous soil areas (at bottom southeast section of unit), displaced sediment could impact high value Sedge Fen Wetland located below.

Response: Recommend partial harvest and partial suspension for unit.

Wildlife/Biological Diversity

Concern: This prescription was designed to retain a wildlife travel corridor. A large amount of high Volstrata is located in this unit. 1 acre of high value (HSI >0.60), 12 acres of medium value (HSI 0.40 to 0.50) deer habitat and 58 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: 50% BA retention prescriptions would mitigate the harvest of high Volstrata and marten habitat values within the unit. Harvest is not expected to isolate habitat and no corridors would be removed.

No resource concerns for: Karst, Wetlands, Scenery, Heritage, Vegetation

Kuiu Unit 207 Alternative 3

- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 207 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	207	**Unit Acres:**	62	**Alternatives:**	5
1999 Aerial Photo:	598_100, 598_101	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	1,789 MBF
TM-Compartment and Stand:	3-129	**Volume Strata Acres:**	High 59 Medium 3 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut.

Logging Method/ Transportation: Cable and Shovel logging / Existing Road 46096

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Streams 1, 2, 4, 5, and 6 are Class IV, Channel Type HC5. Stream 3 is Class III, Channel Type HC6.

Response: Streams 1, 2, 4, 5, and 6: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Stream 3: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Soils

Concern: MMI-4 soils adjacent to SE section of unit. Soils investigation found no past evidence of landslides or windthrow. However, if a landslide occurs within hazardous soil areas (at bottom southeast section of unit), displaced sediment could impact high value Sedge Fen Wetland located below and with clearcut sediment would be more likely to reach wetland below.

Response: Unit boundary was moved to exclude MMI-4 soils.

Wildlife/Biological Diversity

Concern: There is 59 acres high Volstrata is located in this unit. 12 acres of medium value (HSI 0.40-0.50) deer habitat and 58 acres of high value marten (HSI>0.89) habitat are within the unit.

Response: Clearcut harvest would remove all old-growth habitat within the unit. Alternative 5 would isolate and remove travel corridors between high and low elevations.

No resource concerns for: Karst, Wetlands, Scenery, Heritage, Vegetation

Kuiu Unit 207 Alternative 5

- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 207 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	208	**Unit Acres:**	97	**Alternatives:**	3
1999 Aerial Photo:	598_99, 598_100	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	2,835 MBF
TM-Compartment and Stand:	3-130	**Volume Strata Acres:**	High 96 Medium 1 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut.

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class IV, Channel Type HC5.
Stream 2 is Class III, Channel Type HC5.
Stream 3 is Class III, Channel Type HC5.
Stream 4 is Class III, Channel Type HC6.

Response: Stream 1: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 2: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Streams 3 and 4: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Wildlife/Biological Diversity

Concern: Wolf den found in unit in 2003 monitored 2003 – 2005. No activity noted 2004 or 2005. Large amount of high Volstrata reported in this unit. 5 acres of high value (HI >0.60), 78 acres of medium value (HSI 0.40 to 0.50) deer habitat and 96 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: Buffer was placed around den, eastern edge of unit boundary moved to exclude den and buffer. Clearcut harvest would remove all old-growth habitat and reduce deer and marten habitat values. Unit is high elevation and harvest would not isolate habitat and no corridors would be removed.

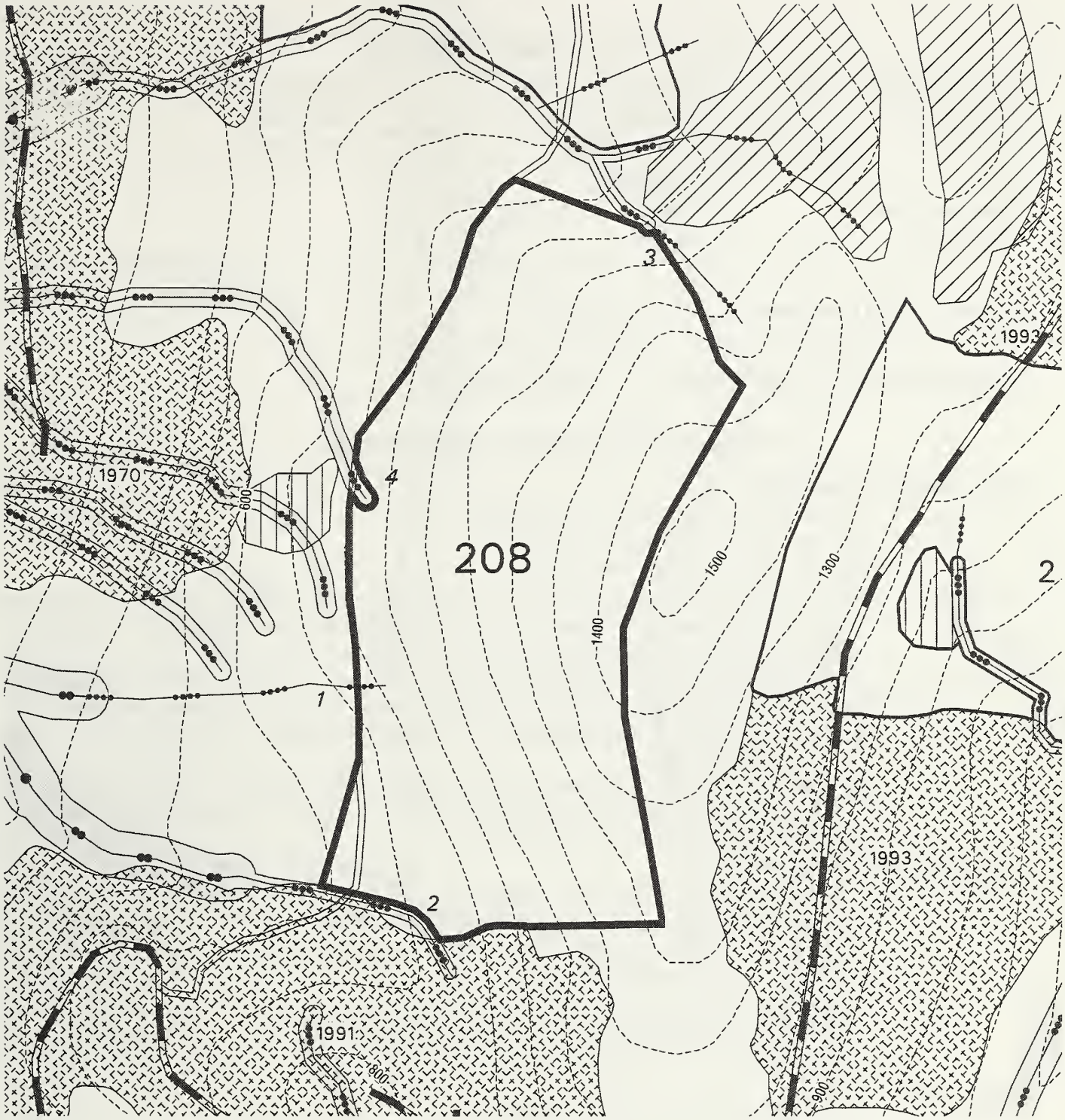
Vegetation/Timber

Concern: Even-aged opening size is close to 100 acres.

Response: During layout ensure harvest unit does not exceed 100 acres.

No resource concerns for: Soils, Karst, Wetlands, Scenery, Heritage

Kuiu Unit 208 Alternative 3



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 208 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	208	**Unit Acres:**	98	**Alternatives:**	4
1999 Aerial Photo:	598_99, 598_100	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	2,847MBF
TM-Compartment and Stand:	3-130	**Volume Strata Acres:**	High 95 Medium 3 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Alt. 4, Even-aged management, clearcut, 98 acres

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class IV, Channel Type HC5.
Stream 2 is Class III, Channel Type HC5.
Stream 3 is Class III, Channel Type HC5.

Response: Stream 1: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of stream courses. Remove any slash deposited in stream course as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Stream 2: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Stream 3: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Wildlife/Biological Diversity

Concern: Wolf den found in unit in 2003 monitored 2003 – 2005. No activity noted 2004 or 2005. Large amount of high Volstrata reported in this unit. 5 acres of high value (HI >0.60), 78 acres of medium value (HSI 0.40 to 0.50) deer habitat and 96 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: Buffer was placed around den, eastern edge of unit boundary moved to exclude den and buffer. Clearcut harvest would remove all old-growth habitat and reduce deer and marten habitat values. Unit is high elevation and harvest would not isolate habitat and no corridors would be removed.

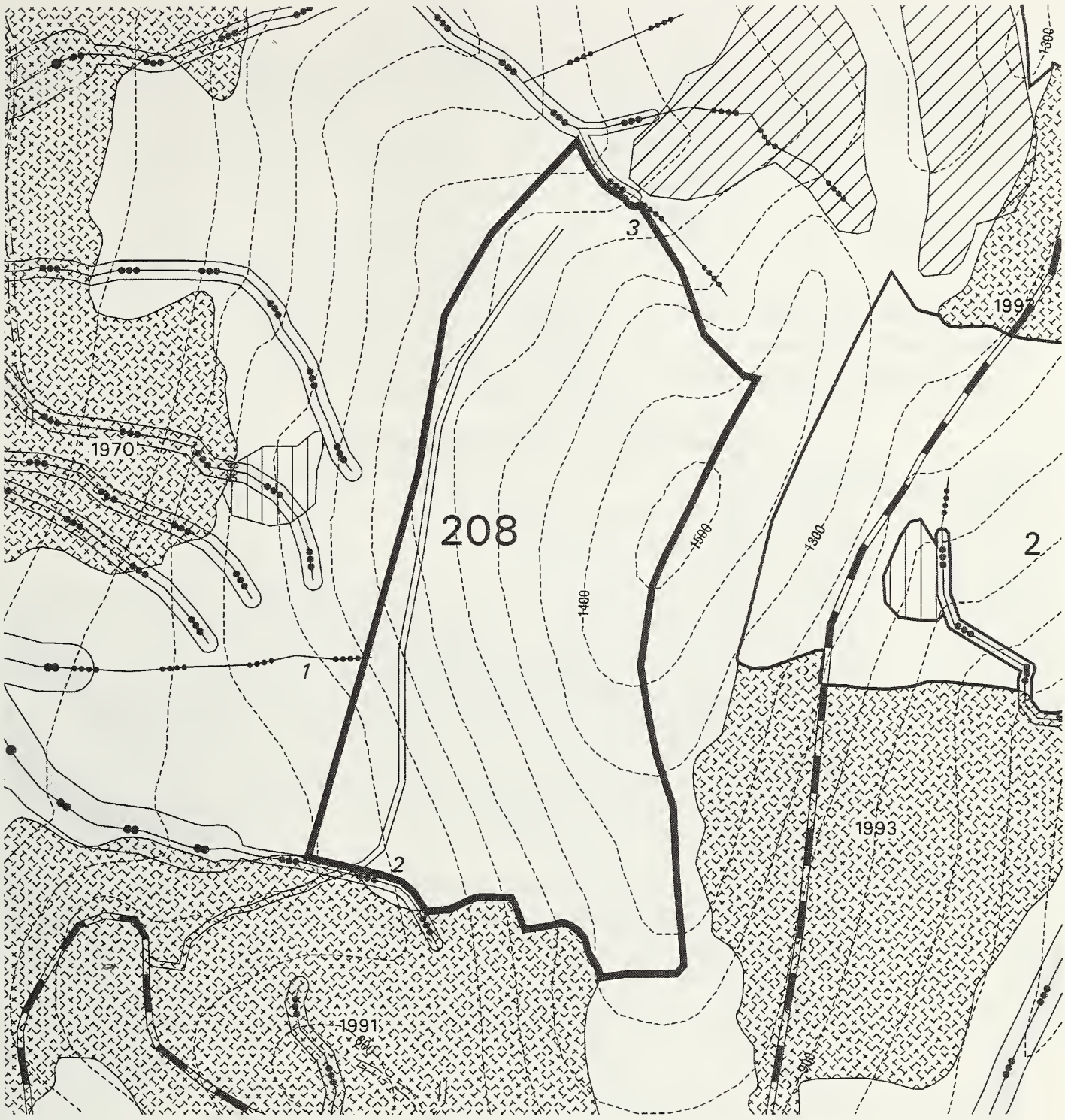
Vegetation/Timber

Concern: Even-aged opening size is close to 100 acres.

Response: During layout ensure harvest unit does not exceed 100 acres.

No resource concerns for: Soils, Karst, Wetlands, Scenery, Heritage

Kuiu Unit 208 Alternative 4



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 208 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	208a	**Unit Acres:**	43	**Alternatives:**	2, 5
1999 Aerial Photo:	598_99, 598_100	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	1,175 MBF
TM-Compartment and Stand:	3-130	**Volume Strata Acres:**	High 25 Medium 18 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class IV, Channel Type HC5.
Stream 2 is Class II, Channel Type HC5.
Stream 3 is Class III, Channel Type HC5.

Response: Stream 1: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 2: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 3: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

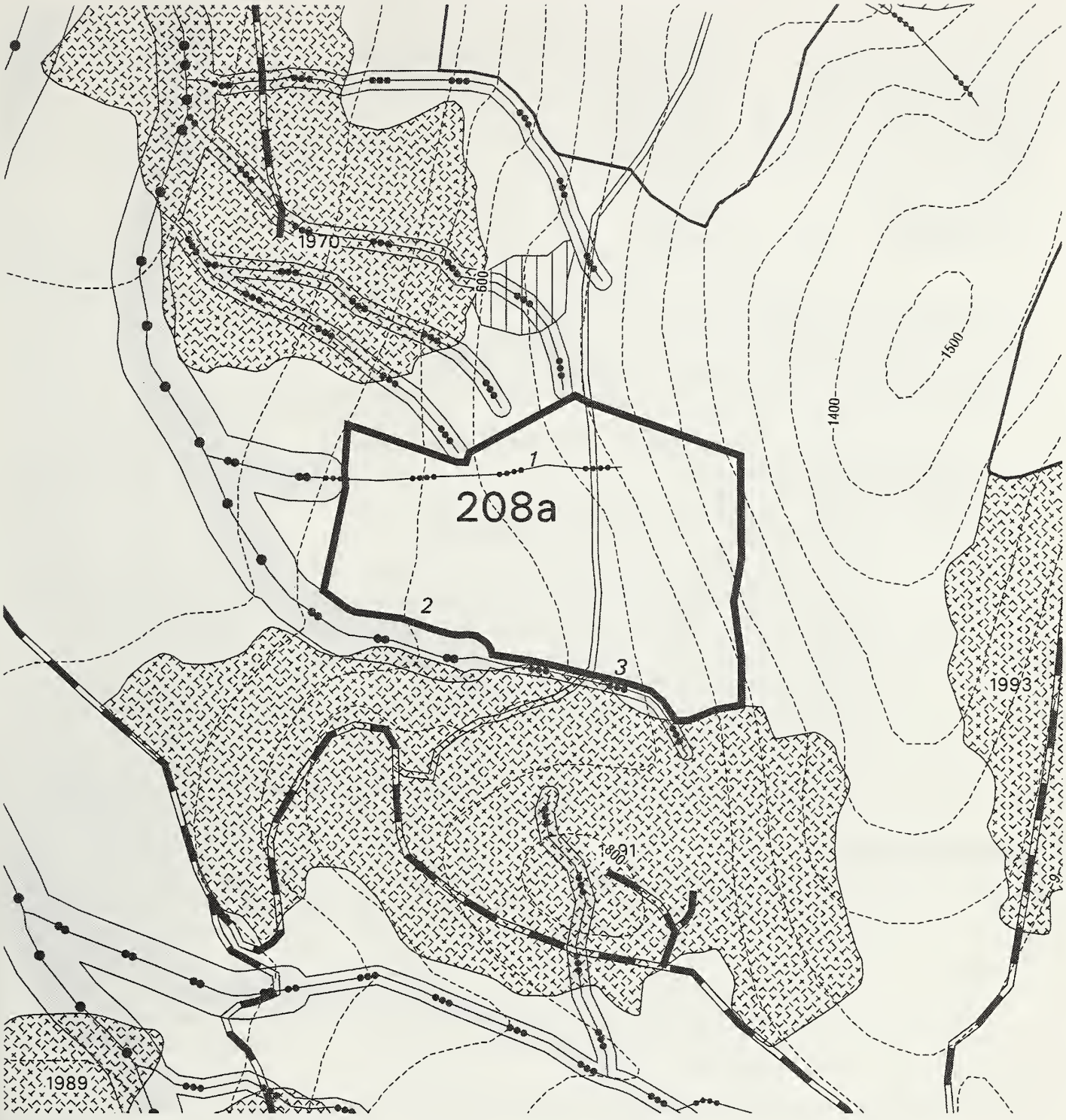
Wildlife/Biological Diversity

Concern: Wolf den found in 2003 and monitored 2003-2005. No activity noted 2004-2005. Large amount of high and medium Volstrata reported in this unit. 9 acres of high value (HSI >0.60), 15 acres of medium value (HSI 0.40 to 0.50) deer habitat and 24 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: Wolf den buffer prescribed for site. Unit split on both sides of den and buffer area. Clearcut prescription will remove all old-growth habitat and reduce the deer and marten habitat values when unit is harvested. Unit is in high elevation harvest would not isolate habitat and no corridors would be removed.

No resource concerns for: Karst, Wetlands, Soils, Scenery, Heritage, Vegetation

Kuiu Unit 208a Alternative 2,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 208a Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	208b	**Unit Acres:**	51	**Alternatives:**	2, 5
1999 Aerial Photo:	598_100, 598_101	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	1,491 MBF
TM-Compartment and Stand:	3-131	**Volume Strata Acres:**	High 49 Medium 2 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class III, Channel Type HC5.
Stream 2 is Class III, Channel Type HC5.

Response: Stream 1: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Stream 2: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Stream 3: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Wildlife/Biological Diversity

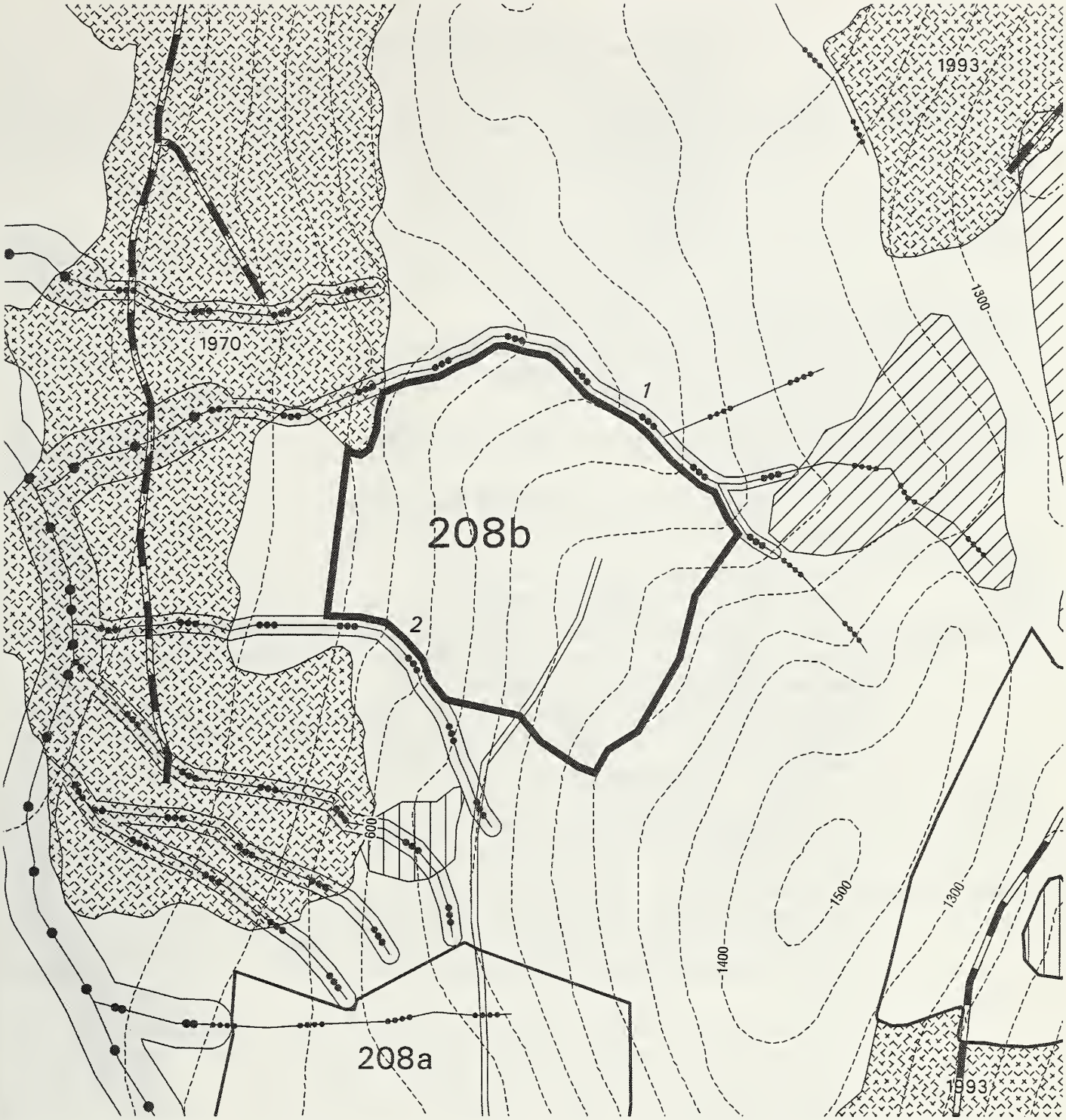
Concern: Wolf den found 2003 and monitored 2003-2005. No activity noted 2004-2005. Large amount of high Volstrata reported in this unit. 21 acres of high value (HSI >0.60), 20 acres of medium value (HSI 0.40 to 0.50) deer habitat and 50 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: ⇒

Wolf den buffer prescribed for site. Unit split on both sides of den and buffer area. Clearcut prescription will remove all old-growth habitat and reduce the deer and marten habitat values when unit is harvested. Unit is high elevation and would not isolate habitat and no corridors would be removed.

No resource concerns for: Karst, Wetlands, Soils, Scenery, Heritage, Vegetation

Kuiu Unit 208b Alternative 2,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 208b Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	209	**Unit Acres:**	64	**Alternatives:**	2, 3, 4, 5
1999 Aerial Photo:	598_100, 598_101	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	931 MBF Alt 2, 3, 4 1,861 MBF Alt 5
TM-Compartment and Stand:	3-132	**Volume Strata Acres:**	High 64 Medium 0 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Alt. 2, 3, 4 Uneven-aged management, 50% BA retention, Group Selection, 19 acres, Uneven-aged Management, 50% BA retention, Single Tree Selection, 45 acres.

Alt. 5 Even-aged management, clearcut.

Logging Method/ Transportation: Cable / Use existing Road 46096

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class III, Channel Type HC5.
Stream 2 is Class IV, Channel Type HC5.

Response: Stream 1: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 2: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities.

Soils

Concern: 2 acres MMI-4 soils above Class III stream in V-notch.

Response: Area excluded from unit in all alternatives.

Wildlife/Biological Diversity

Concern: Black bear, red-breasted sapsucker activity and game trails were noted in the unit. Entire unit is comprised of high Volstrata. 11 acres of high value (HSI >0.60), 19 acres of medium value (HSI 0.40 to 0.50) deer habitat and 65 acres of high value marten (HSI >0.89) habitat are located with the unit.

Response: 50% BA retention would mitigate the harvest of old-growth and deer and marten habitat values within the unit in Alternatives 2, 3, and 4. Clearcut harvest would remove all old-growth and reduce deer and marten habitat values in Alternative 5. Harvest would not isolate habitat and corridors in Alternatives 2, 3 and 4. Alternative 5 would isolate high elevation habitat and remove the travel corridors.

No resource concerns for: Karst, Wetlands, Scenery, Heritage, Vegetation

Kuiu Unit 209 Alternative 2,3,4,5

- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 209 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	210	**Unit Acres:**	48	**Alternatives:**	3, 4, 5
1999 Aerial Photo:	598_97, 98, 99	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	1,374 MBF
TM-Compartment and Stand:	3-133	**Volume Strata Acres:**	High 44 Medium 4 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class III Channel Type HC2.
Streams 2, 3, 4, and 5 are Class IV, Channel Type HC2.

Response: Stream 1: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Streams 2, 3, 4, and 5: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Soils

Concern: Steep cliff area just southwest of unit

Response: Place backline just below steep area.

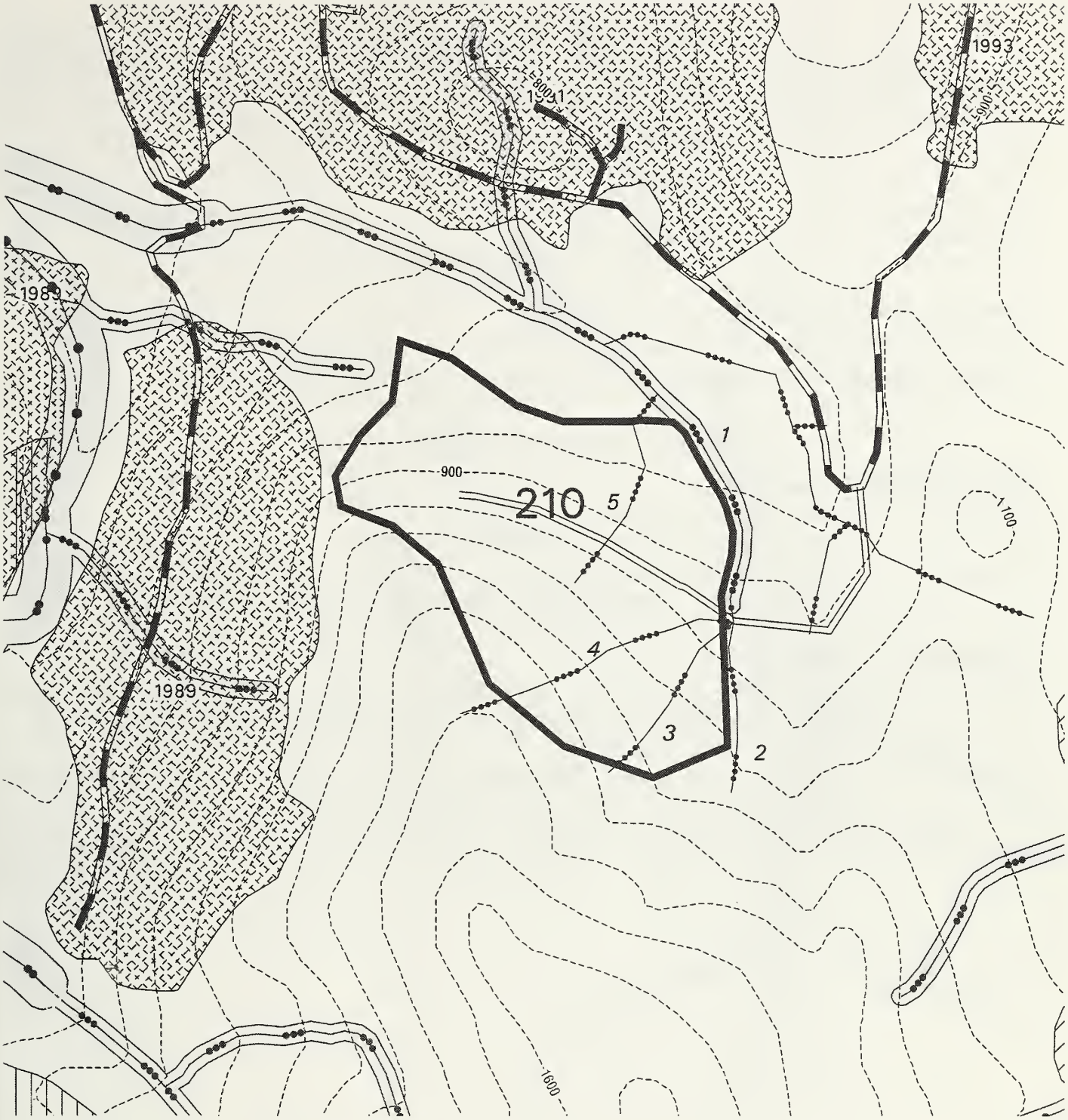
Wildlife/Biological Diversity

Concern: Large amount of high Volstrata reported in this unit. 5 acres of medium value (HSI 0.40 to 0.50) deer habitat and 42 acres of high value marten (HSI >0.89) habitat locate within unit.
Clearcut harvest would remove all old-growth habitat and reduce deer and marten habitat values.

Response: Harvest would not isolate habitat and no corridors will be removed.

No resource concerns for: Scenery, Heritage, Vegetation, Karst, Wetlands

Kuiu Unit 210 Alternative 3,4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 210 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	211	**Unit Acres:**	36	**Alternatives:**	4, 5
1999 Aerial Photo:	598_97, 98, 99	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	798 MBF
TM-Compartment and Stand:	3-134	**Volume Strata Acres:**	High 20 Medium 5 Low 5 Non-forest 6		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / One temporary road and existing Road 46096

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class IV, Channel Type HC5.
Stream 2 is Class IV, Channel Type HC2.

Response: Streams 1 and 2: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

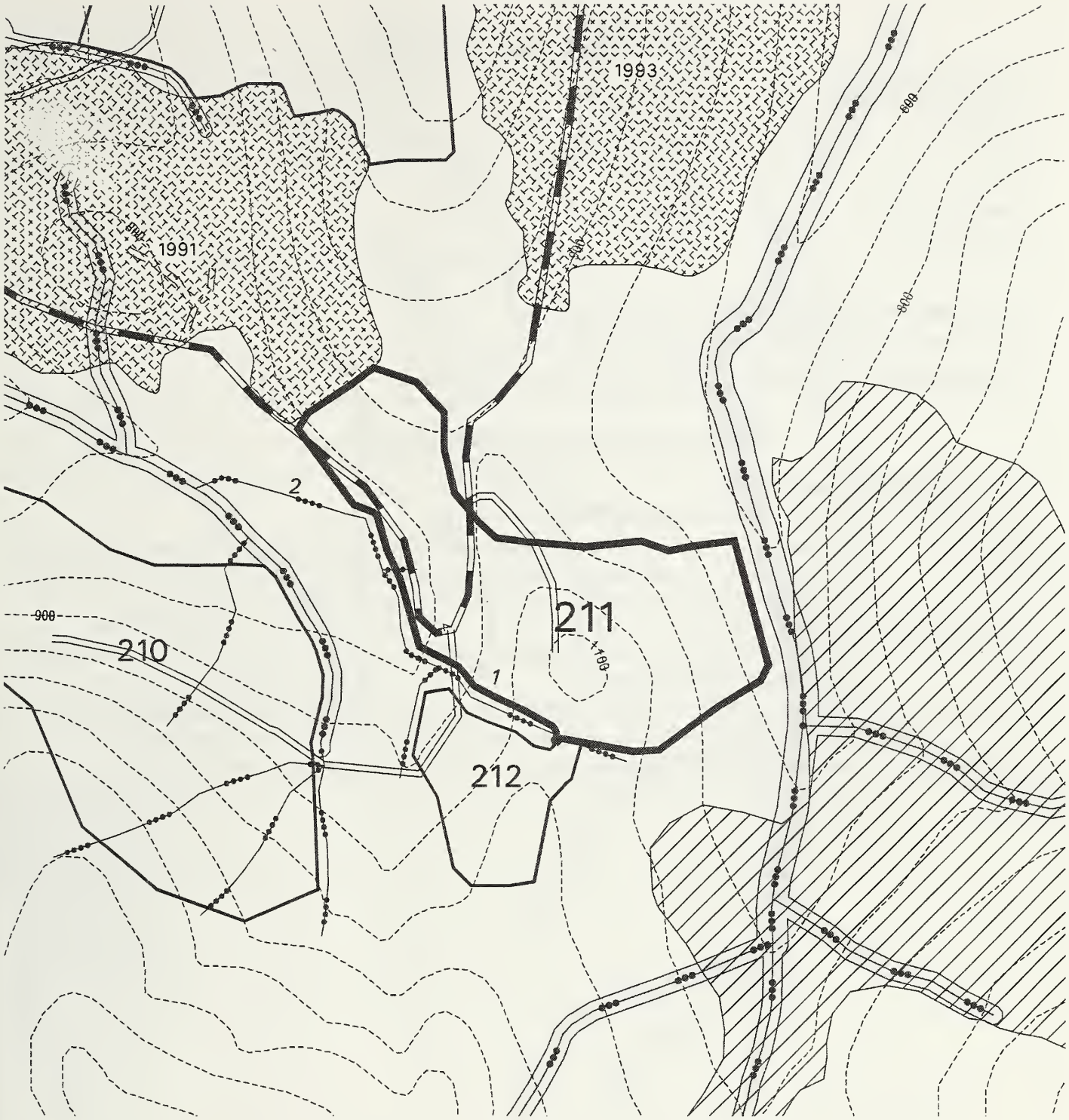
Wildlife/Biological Diversity

Concern: Large amount of high Volstrata reported in this unit. 2 acres of high value (HSI >0.60), 6 acres of medium value (HSI 0.40 to 0.50) deer habitat and 20 acres of high value marten (HSI >0.89) habitat are located within unit.

Response: Clearcut harvest would remove all old-growth habitat and reduce deer and marten habitat values. Harvest would not isolate habitat and no corridors would be removed.

No resource concerns for: Soils, Karst, Wetlands, Scenery, Heritage, Vegetation

Kuiu Unit 211 Alternative 4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 211 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	212	**Unit Acres:**	9	**Alternatives:**	4, 5
1999 Aerial Photo:	598_97, 98, 99	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	217 MBF
TM-Compartment and Stand:	3-135	**Volume Strata Acres:**	High 7 Medium 1 Low 0 Non-forest 1		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Shovel / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Streams 1 and 2 are Class IV, Channel Type HC5.

Response: Streams 1 and 2: Split yard away from class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

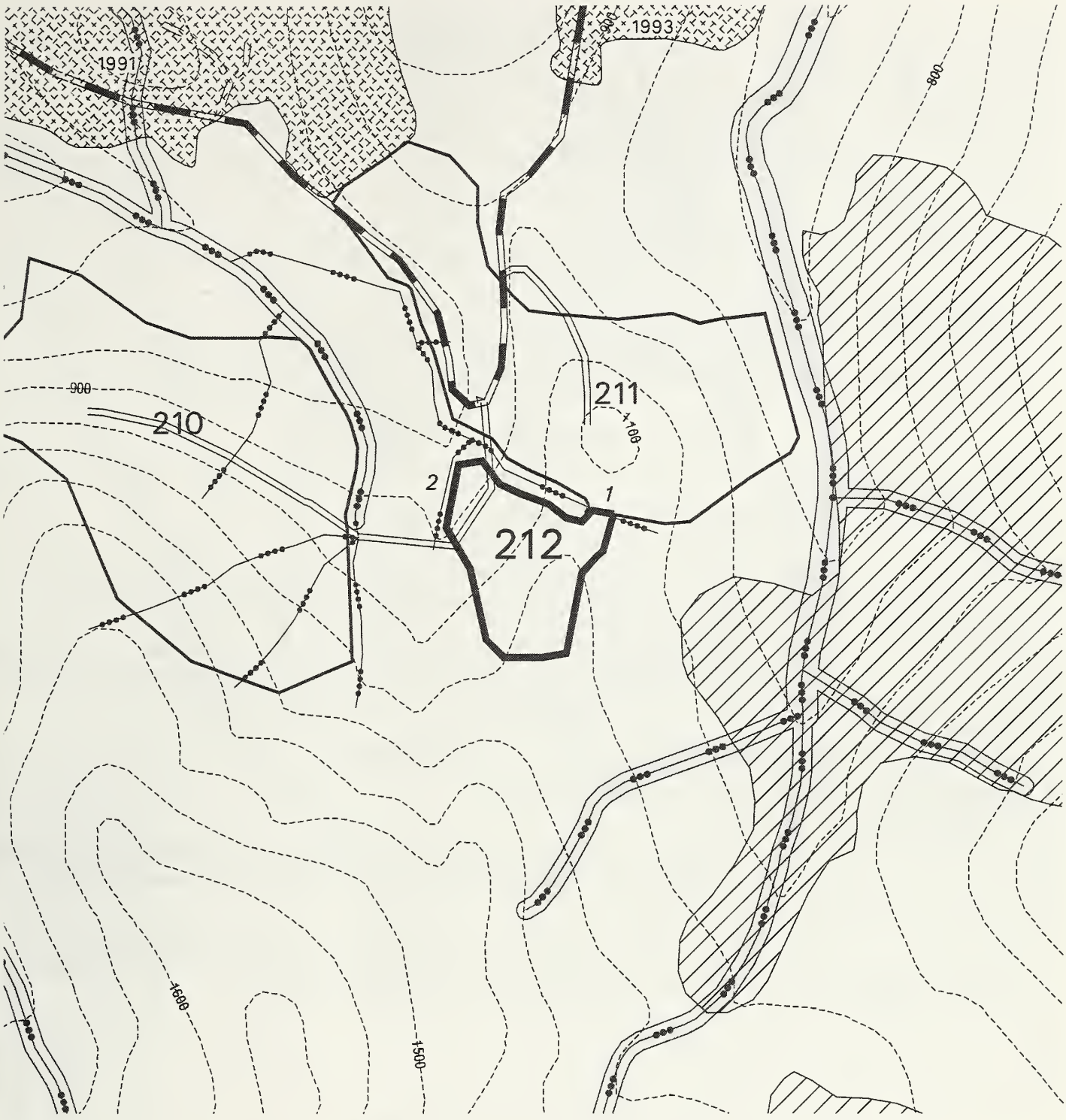
Wildlife/Biological Diversity

Concern: 6 acres of medium value (HSI 0.40 to 0.50) deer habitat and 7 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: Clearcut harvest would remove old-growth habitat and reduce the marten habitat values when unit is harvested. Harvest would not isolate habitat and no corridor would be removed.

No resource concerns for: Soils, Karst, Wetlands, Scenery, Heritage, Vegetation

Kuiu Unit 212 Alternative 4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 212 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	302	**Unit Acres:**	66	**Alternatives:**	4
1999 Aerial Photo:	298_123, 298_124	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	969 MBF
TM-Compartment and Stand:	3-136	**Volume Strata Acres:**	High 66 Medium 0 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Uneven-aged management, 50% BA retention, Single Tree Selection

Logging Method/ Transportation: Helicopter / Use landing on existing Road 6413

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Streams 1, 4, and 7 are Class III, Channel Type HC5
Streams 2, 3, 5, and 6 are Class IV, Channel Type HC5.

Response: Streams 1, 4, and 7: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Streams 2, 3, 5, and 6: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Soils

Concern: Steep soils exist in patches in unit

Response: Helicopter harvest with full suspension

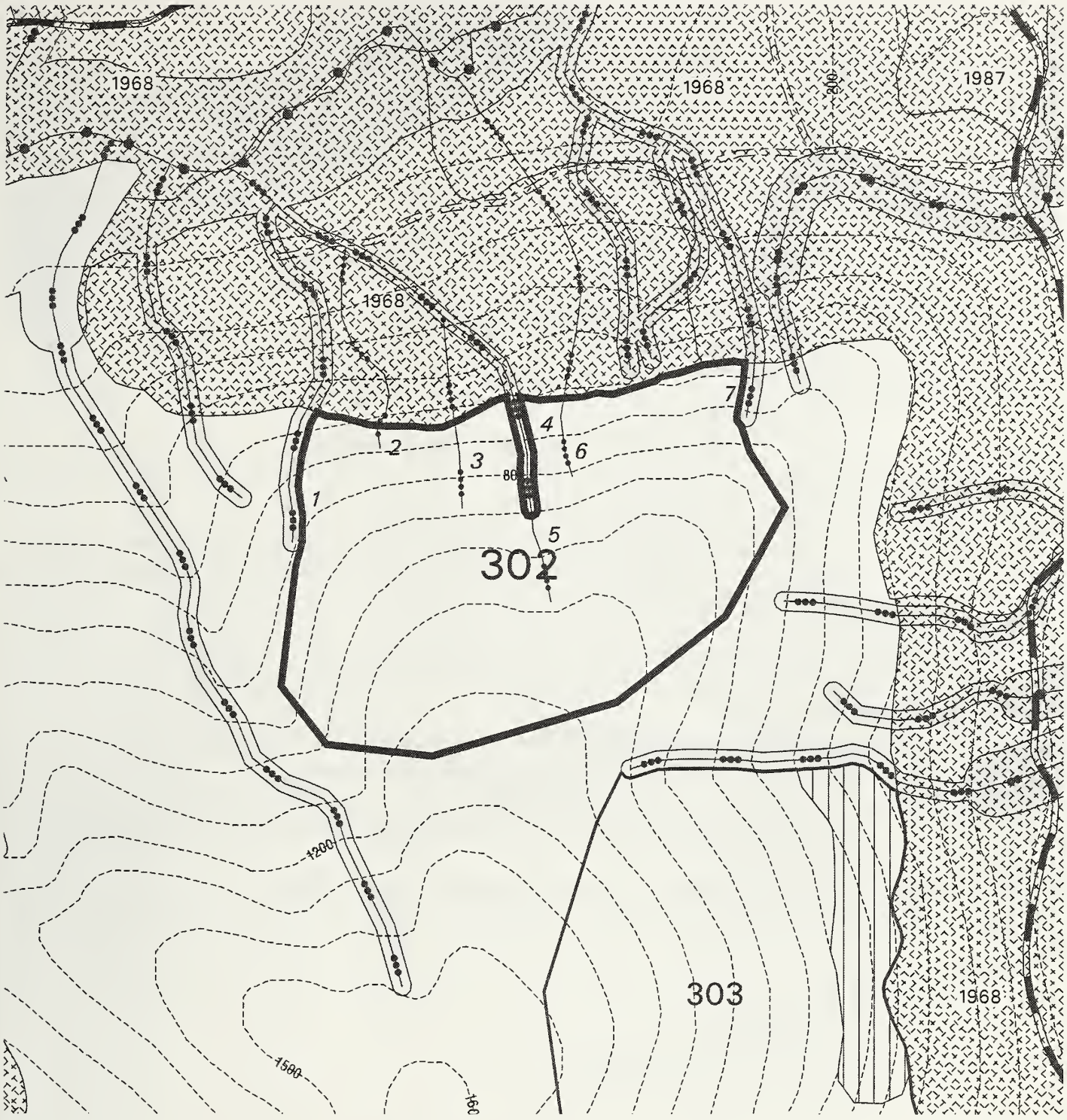
Wildlife/Biological Diversity

Concern: Large amount of high Volstrata in unit. Less than one acre of high value (HSI >0.60), 30 acres of medium value (HSI 0.40 to 0.50) deer habitat and 66 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: 50% BA retention would help maintain old-growth characteristics and values and retain high value marten habitat. Harvest would not isolate habitat and no corridors would be removed.

No resource concerns for: Scenery, Heritage, Vegetation, Wetlands, Karst

Kuiu Unit 302 Alternative 4



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 302 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	303	**Unit Acres:**	68	**Alternatives:**	4
1999 Aerial Photo:	598_130, 598_131	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	994 MBF
TM-Compartment and Stand:	3-137	**Volume Strata Acres:**	High 68 Medium 0 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Uneven-aged management, 50% BA retention, Single Tree Selection.

Logging Method/ Transportation: Helicopte / Use landings on existing Road 6413

Resource Concerns & Responses

Watershed/Fisheries

Concern: Streams 1, 2, 3, and 4 are Class III, Channel Type HC6.

Response: Streams 1, 2, 3, and 4: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Soils

Concern: Evidence of windthrow in unit. 10 acres MMI-4 soils.

Response: Partial cut with helicopter harvest (full suspension), avoiding steepest areas.

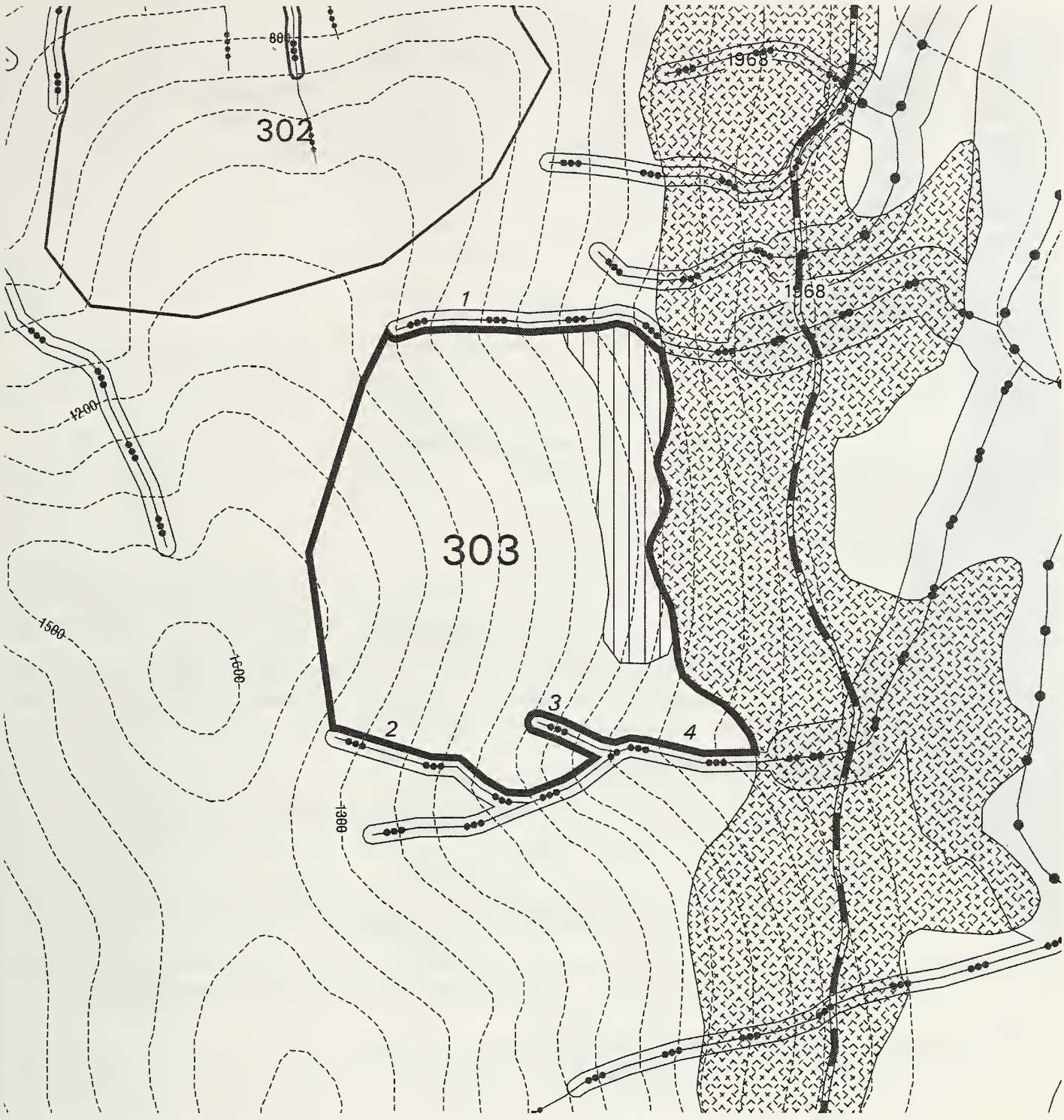
Wildlife/Biological Diversity

Concern: Large amount of high Volstrata in unit. 22 acres of high value (HSI >0.60) deer habitat and 66 acres of high value marten (HSI >0.89) habitat within the unit.

Response: 50% BA retention would mitigate harvest by retaining old-growth characteristics and values and retain marten and deer habitat. Harvest would not isolate habitat and no corridors would be removed.

No resource concerns for: Scenery, Heritage, Vegetation, Karst, Wetlands

Kuiu Unit 303 Alternative 4



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 303 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	305	**Unit Acres:**	36	**Alternatives:**	4
1999 Aerial Photo:	598_131, 598_132	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	528 MBF
TM-Compartment and Stand:	3-138	**Volume Strata Acres:**	High 36 Medium 0 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Uneven-aged management, 50% BA retention, Single Tree Selection.

Logging Method/ Transportation: Helicopter / Use landing on existing Road 6413

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class III, Channel Type HC5.
Stream 2 is Class IV, Channel Type HC5.
Stream 3 is Class III, Channel Type HC6.

Response: Streams 1 and 3: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16
Stream 2: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Soils

Concern: Steep soils exist in patches in unit, 12.5 acres MMI-4

Response: Helicopter harvest with full suspension, avoid steepest areas by selective harvest.

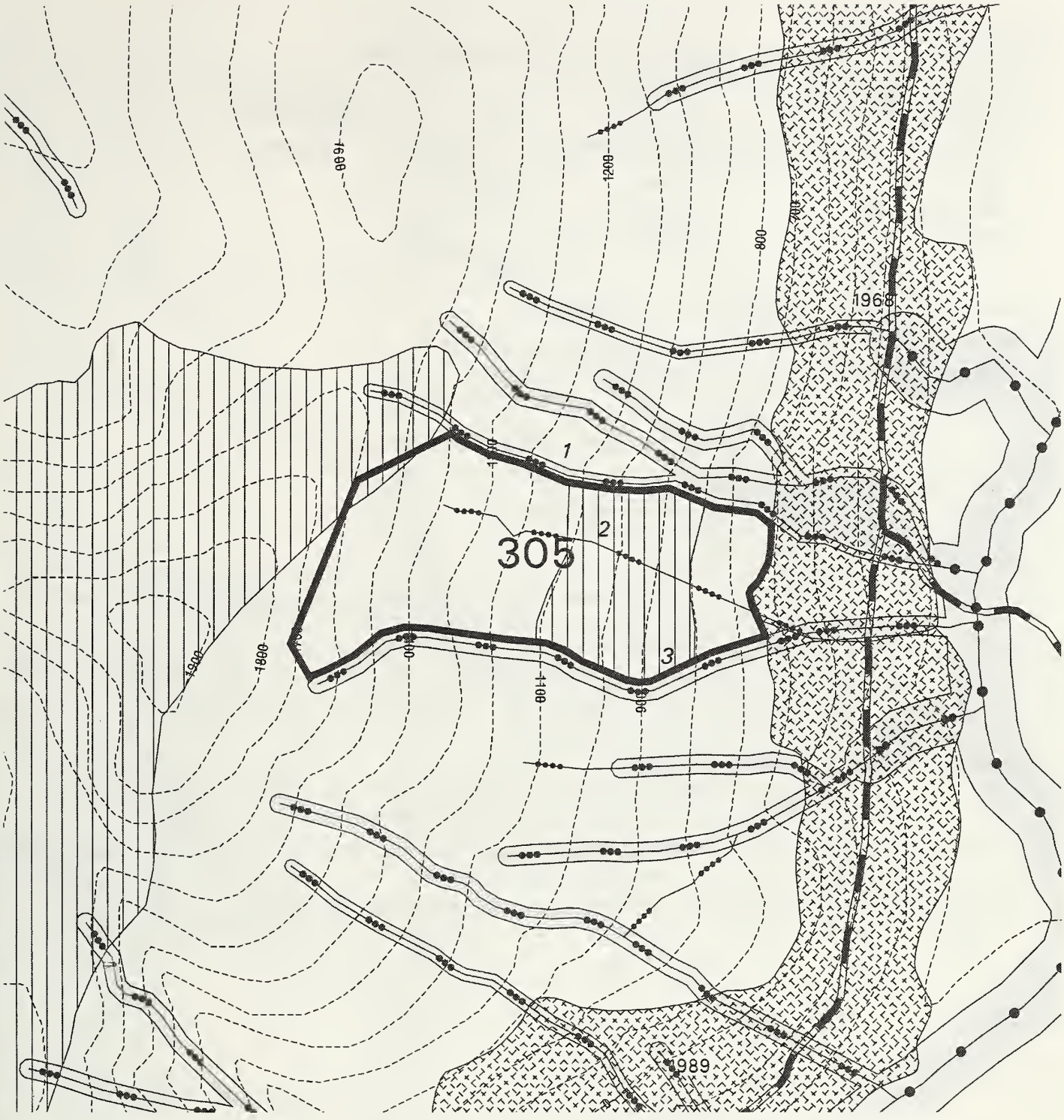
Wildlife/Biological Diversity

Concern: Large amount of high Volstrata in unit. 5 acres of high value (HSI >0.60) deer habitat and 32 acres of high value marten (HSI >0.89) habitat are within unit.

Response: 50% BA retention would mitigate harvest by retaining old-growth characteristics and values and retain marten and deer habitat. Harvest would not isolate habitat and no corridors would be removed.

No resource concerns for: Scenery, Heritage, Vegetation, Wetlands, Karst

Kuiu Unit 305 Alternative 4



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 305 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	307	**Unit Acres:**	17	**Alternatives:**	3, 4, 5
1999 Aerial Photo:	598_132, 598_133	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	444 MBF
TM-Compartment and Stand:	3-139	**Volume Strata Acres:**	High 8 Medium 9 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Watershed/Fisheries

Concern: Stream 1 is Class III, Channel Type HC6.
Stream 2 is Class I MM2.

Response: Stream 1: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16
Stream 2: No programmed com ial timber harvest in the RMA, which is defined as the greatest of the floodplain, ripari. egetation or soils, riparian associated wetland fens, or 120 feet. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

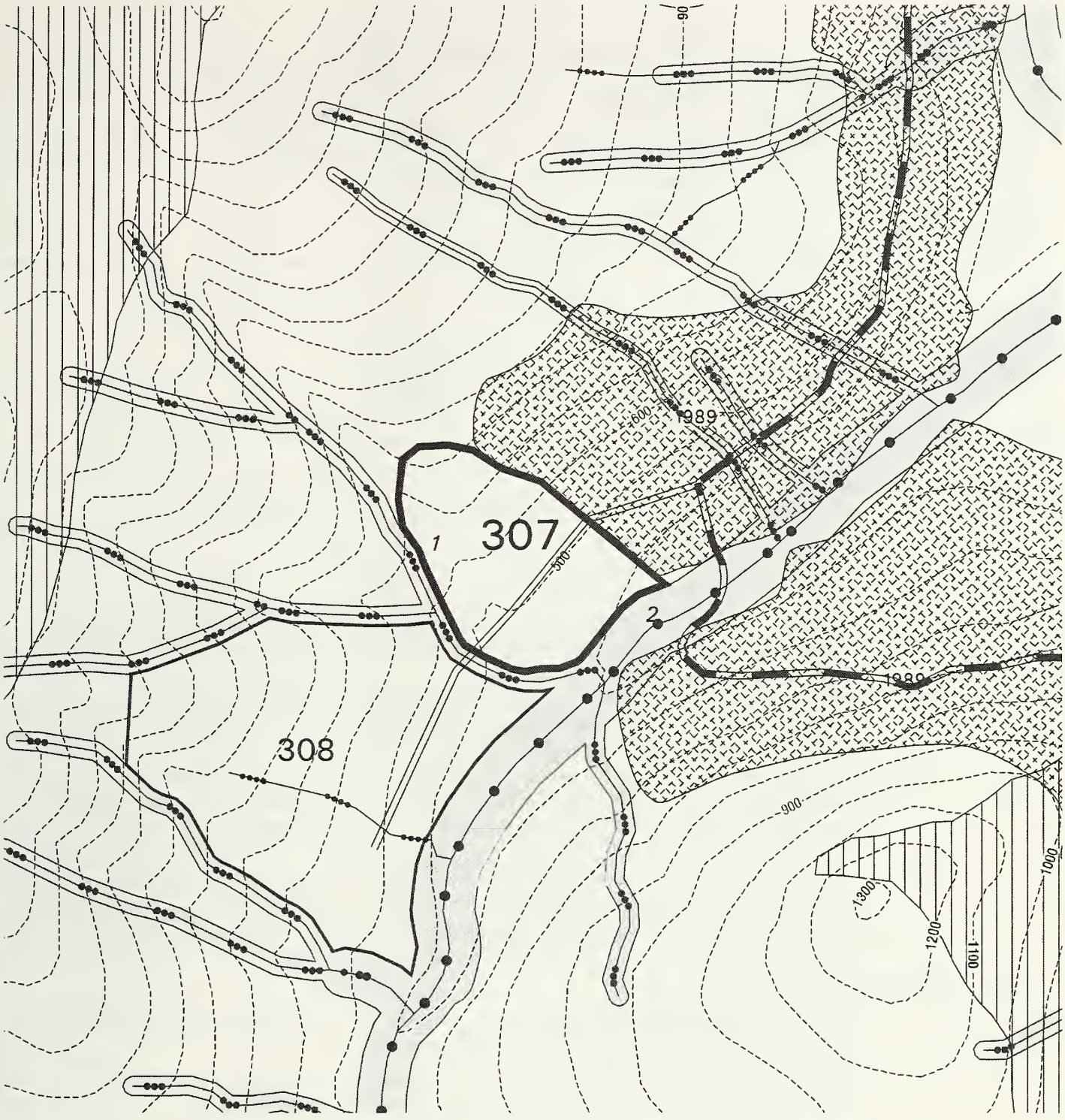
Wildlife/Biological Diversity

Concern: Large amount of high and medium Volstrata in unit. 8 acres of high value (HSI >0.60) deer habitat and 8 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: Clearcut harvest would remove all old-growth habitat and reduce deer and marten habitat values. Harvest would not isolate habitat and no corridors will be removed.

No resource concerns for: Soils, Wetlands, Karst, Scenery, Heritage, Vegetation

Kuiu Unit 307 Alternative 3,4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 307 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	308	**Unit Acres:**	39	**Alternatives:**	3, 4, 5
1999 Aerial Photo:	298_126, 298_127	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	977 MBF
TM-Compartment and Stand:	3-140	**Volume Strata Acres:**	High 6 Medium 33 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable and Shovel / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Streams 1, 2, and 4 are Class III, Channel Type HC6.
Stream 3 is Class IV Channel Type HC5.
Stream 5 is Class II Channel Type HC6.
Stream 6 is Class I Channel Type MM2.

Response: Streams 1, 2, and 4: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the RMA. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 3: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 5: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater. Provide reasonable assurance of windfirmness of the RMA. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 6: No programmed commercial timber harvest in the RMA, which is defined as the greatest of the flood plain, riparian vegetation or soils, riparian associated wetland fens, or 120 feet. Provide reasonable assurance of windfirmness of the RMA. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

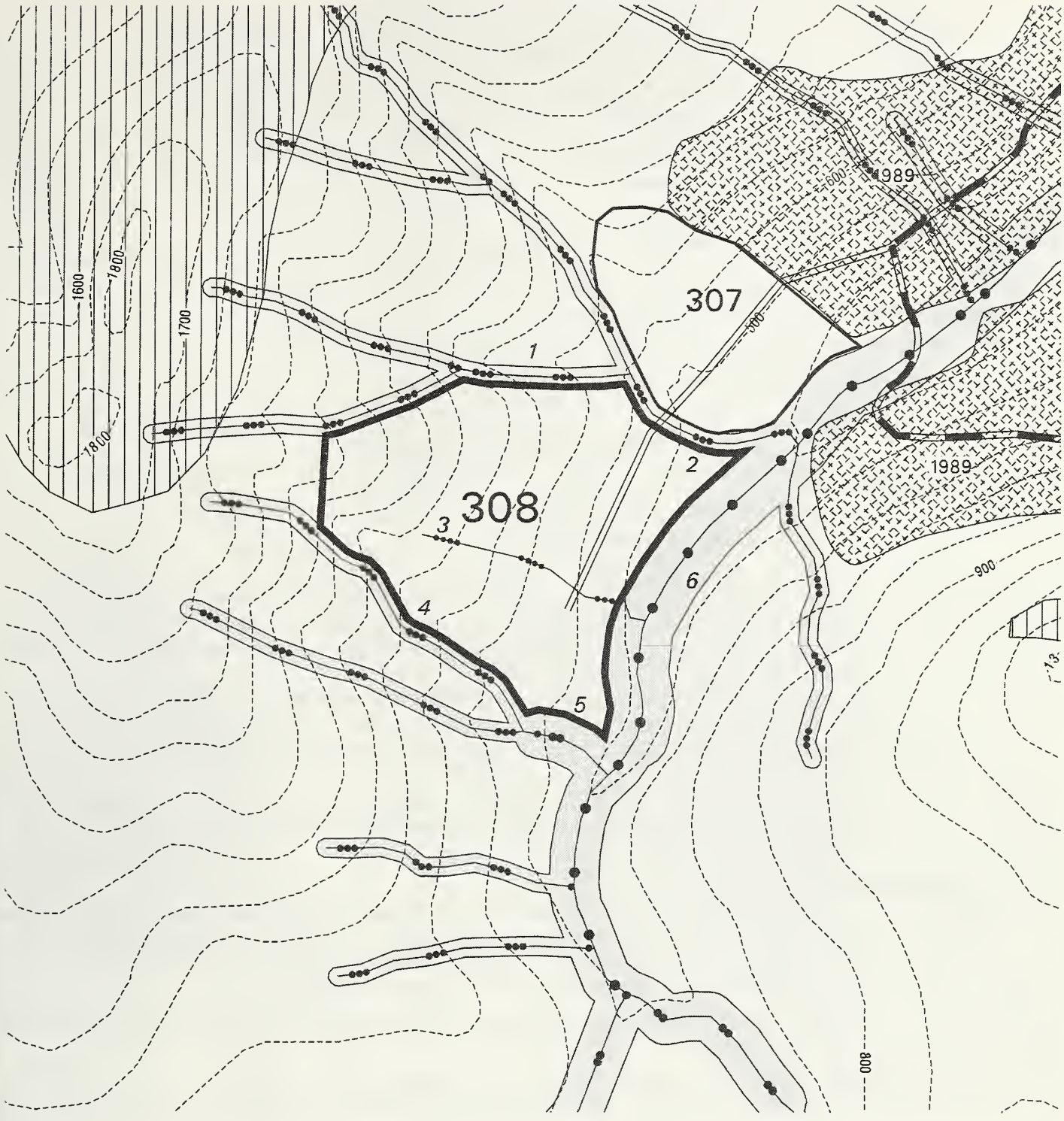
Wildlife/Biological Diversity

Concern: Large amount of medium Volstrata in unit. 5 acres of high value (HSI >0.60) deer habitat and 5 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: Clearcut harvest would remove all old-growth habitat and reduce deer and marten habitat values. Harvest would not isolate habitat and no corridors would be removed.

No resource concerns for: Soils, Wetlands, Karst, Scenery, Heritage, Vegetation

Kuiu Unit 308 Alternative 3,4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 308 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	401	**Unit Acres:**	20	**Alternatives:**	4, 5
1999 Aerial Photo:	198_72, 198_73	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	586 MBF
TM-Compartment and Stand:	2-127	**Volume Strata Acres:**	High 20 Medium 0 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Watershed/Fisheries

Concern: Stream 1 is Class I, Channel Type MM1.
Stream 2 is Class II, Channel Type HC3.
Stream 3 is Class III, Channel Type HC6.

Response: Stream 1: No programmed commercial timber harvest in the RMA, which is defined as the greatest of the flood plain, riparian vegetation or soils, riparian associated wetland fens, or 120 feet. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 2: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 3: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Wildlife/Biological Diversity

Concern: IDT recommended dropping this unit from alternatives 2 and 3 because it was a wildlife corridor between two existing clearcuts. Large amount of high Volstrata would be harvested in this unit. 17 acres of high value (HSI >0.60), 3 acres of medium value (HSI 4.0 to 5.0) deer habitat and 20 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: Clearcut harvest would remove all old-growth habitat and reduce deer and marten habitat values. Harvest would remove wildlife corridor.

No resource concerns for: Soils, Scenery, Heritage, Vegetation, Karst, Wetlands

Kuiu Unit 401 Alternative 4,5

- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 401 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	402	**Unit Acres:**	24	**Alternatives:**	4, 5
1999 Aerial Photo:	298_129, 298_130	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	678 MBF
TM-Compartment and Stand:	6-36	**Volume Strata Acres:**	High 19 Medium 3 Low 2 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Streams 1,2, and 4 are Class IV, Channel Type HC5.
Stream 3 is Class IV, Channel Type HC2.
Stream 5 is Class II, Channel Type HC2.
Stream 6 is Class III, Channel Type HC2.

Response: Streams 1, 2, 3, and 4: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 5: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 6: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Concern: Access road would cross a Class II stream.

Response: Install a log stringer bridge. Designate location of stream crossing and minimize stream channel disturbance from construction/decommissioning (BMPs 14.14; 14.17).

Wetlands

Concern: Forested wetland exists in the unit.

Response: Suitable for cable harvest with partial suspension, too wet for shovel.

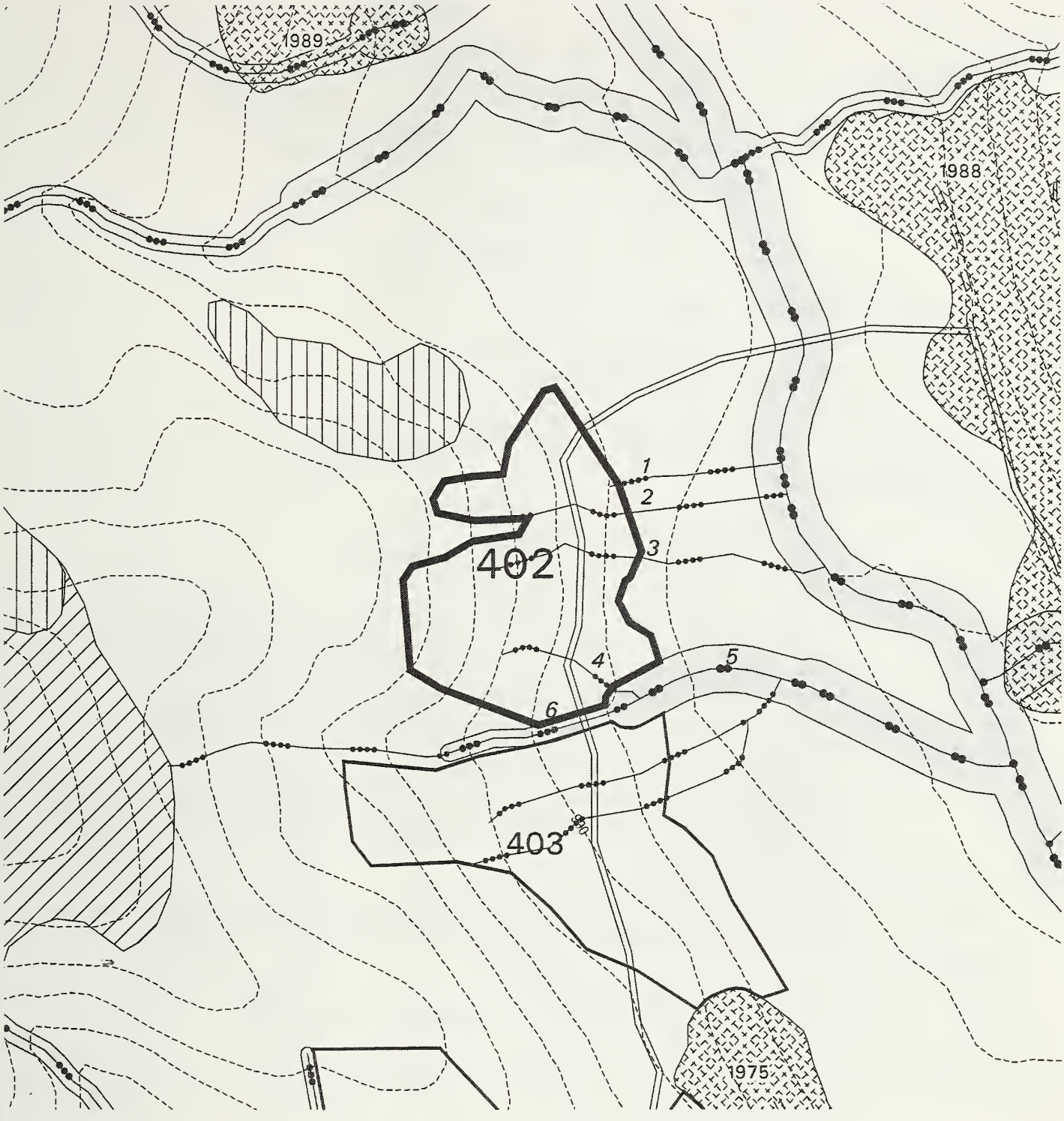
Wildlife/Biological Diversity

Concern: Unit is potential wildlife travel corridor. Large amount of high Volstrata would be harvested in this unit. 1 acre of high value (HSI >0.60) deer and 19 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: Clearcut harvest would remove all old-growth and reduce the deer and marten habitat values. Harvest would remove travel corridor.

No resource concerns for: Scenery, Heritage, Vegetation, Soils, Wetlands, Karst

Kuiu Unit 402 Alternative 4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 402 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	403	**Unit Acres:**	29	**Alternatives:**	3, 4, 5
1999 Aerial Photo:	298_129, 130, 131	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	825 MBF
TM-Compartment and Stand:	6-137	**Volume Strata Acres:**	High 26 Medium 3 Low 0 Non forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Streams 1 and 5 are Class IV, Channel Type HC5.
Stream 2 is Class III, Channel Type HC2.
Stream 4 is Class IV, Channel Type HC2.
Stream 3 is Class II, Channel Type HC2.

Response: Streams 1, 4, and 5: Split yard away from class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 2: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 3: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Concern: Access road would cross a Class II stream.

Response: Install a log stringer bridge. Designate location of stream crossing and minimize stream channel disturbance from construction/decommissioning (BMPs 14.14, 14.17).

Wetlands

Concern: Forested wetland exists in the unit

Response: Suitable for cable harvest with partial suspension, too wet for shovel.

Concern: Road crosses wetlands.

Response: Follow BMPs when constructing road in wetland (examples include, minimizing road width and deep placement of culverts).

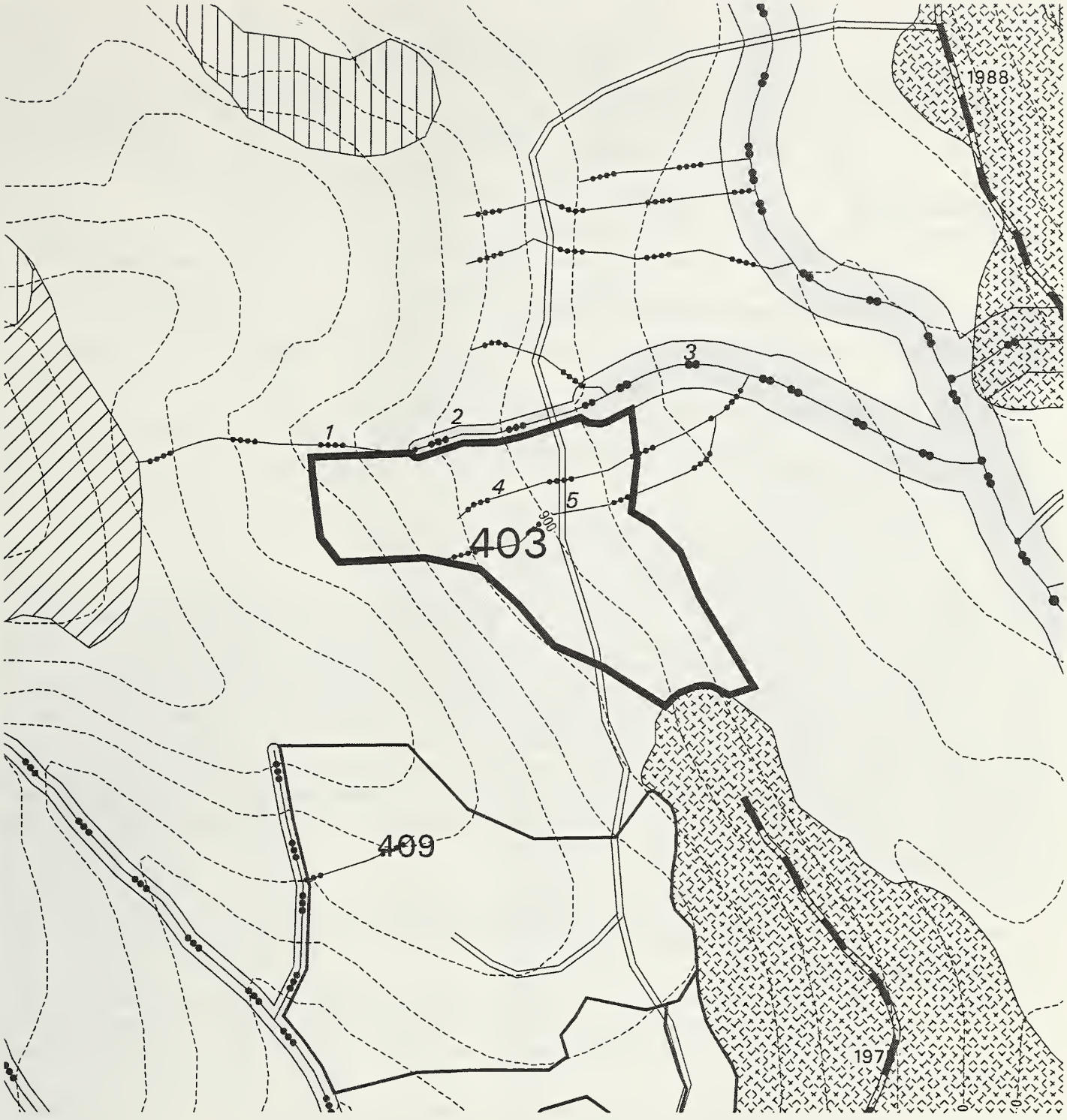
Wildlife/Biological Diversity

Concern: Large amount of high Volstrata would be harvested in this unit. 6 acres of high value (HSI >0.60) deer habitat and 26 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: Clearcut harvest would remove all old-growth habitat and reduce deer and marten habitat values.

No resource concerns for: Scenery, Heritage, Vegetation, Soils, Karst

Kuiu Unit 403 Alternative 3,4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 403 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	404	**Unit Acres:**	28	**Alternatives:**	2, 3, 4, 5
1999 Aerial Photo:	598_136, 598_137	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	394 MBF Alt 2, & 3 787 MBF Alt 4 & 5
TM-Compartment and Stand:	6-38	**Volume Strata Acres:**	High 23 Medium 4 Low 1 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: **Alt. 2, 3** Uneven-aged management, 50% BA retention, Single Tree Selection.

Alt. 4, 5 Even-aged management.

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class IV, Channel Type HC5.
Stream 2 is Class III, Channel Type HC2.
Stream 3 is Class I, Channel Type MC2.
Stream 4 is Class IV, Channel Type HC5.

Response: Stream 1 and 4: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 2: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 3: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the channel, or to the top of the side-slope break, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Wetlands

Concern: Forested wetland exists in the unit.

Response: Suitable for cable harvest with partial suspension, too wet for shovel.

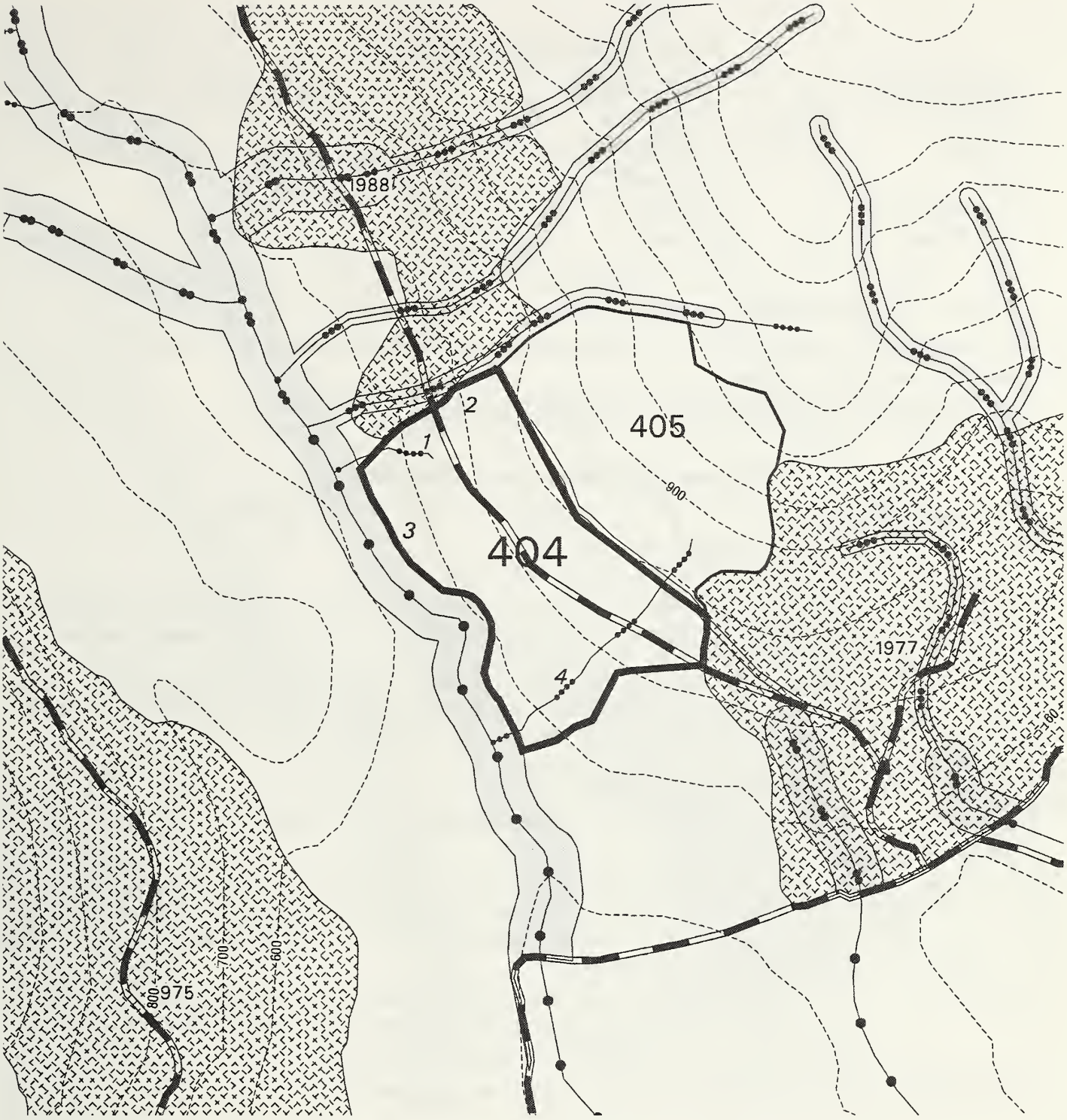
Wildlife/Biological Diversity

Concern: Unit includes portion of a corridor between two existing managed stands. High and medium Volstrata are within the unit. 21 acres of high value (HSI >0.60), 4 acres of medium value (HSI 4.0-5.0) deer habitat and 23 acres of high value marten (HSI >0.89) habitat are within the unit.

Response: Partial harvest with 50% BA retention would mitigate impacts to old-growth, help retain marten and deer habitat, and maintain corridor in Alternatives 2 and 3.. Clearcut harvest systems would remove all old-growth, reduce deer and marten habitat values, and remove corridor in Alternatives 4 and 5.

No resource concerns for: Scenery, Heritage, Vegetation, Soils, Karst

Kuiu Unit 404 Alternative 2,3,4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 404 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	405	**Unit Acres:**	25	**Alternatives:**	2, 3, 4, 5
1999 Aerial Photo:	598_136, 598_137	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	365 MBF Alt 2 & 3 729 MBF Alt 4 & 5
TM-Compartment and Stand:	6-39	**Volume Strata Acres:**	High 25 Medium Low Non-forest		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Alt. 2, 3 Two-aged management, 50% BA retention, clearcut with reserves.

Alt. 4, 5 Even-aged management.

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class III, Channel Type HC2.
Stream 2 is Class IV, Channel Type HC5.

Response: Stream 1: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 2: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Wetlands

Concern: Forested wetland exists in the unit.

Response: Suitable for cable harvest with partial suspension, too wet for shovel.

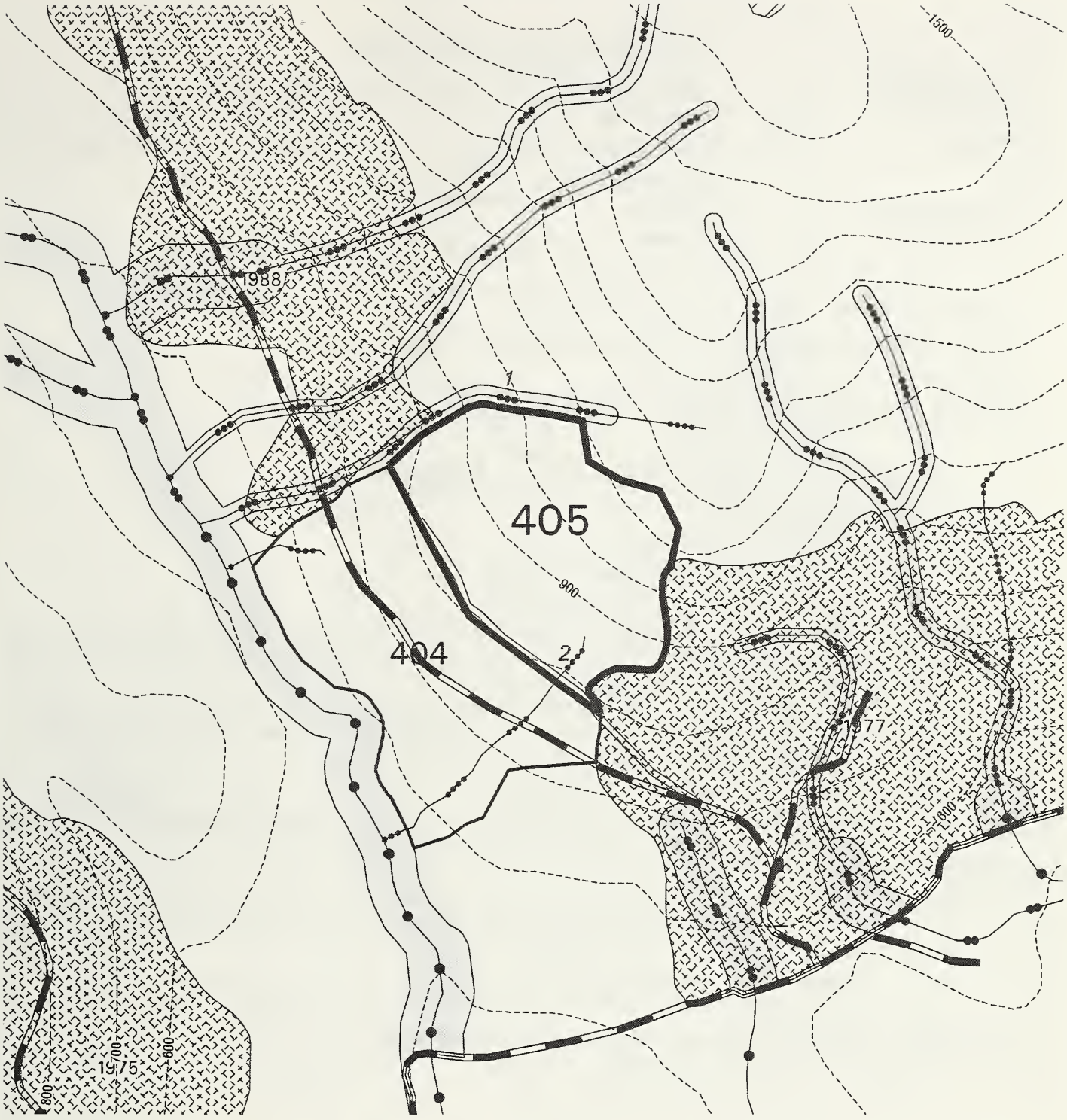
Wildlife/Biological Diversity

Concern: This unit linked with unit 404 is a wildlife corridor between two previously harvested units. High Volstrata would be harvested in this unit. Less than one acre of high value (HSI >0.60), 25 acres of medium value (HSI 4.0-5.0) deer habitat and 25 acres of high value marten (HSI >0.89) habitat would be harvested within this unit.

Response: Partial harvest with 50% BA retention would mitigate impacts to old-growth habitat, retain marten and deer habitat, and retain the corridor. Clearcut harvest would remove old-growth, reduce deer and marten habitat values, and remove the corridor.

No resource concerns for: Soils, Karst, Scenery, Heritage, Vegetation

Kuiu Unit 405 Alternative 2,3,4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 405 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	409	**Unit Acres:**	46	**Alternatives:**	3, 4, 5
1999 Aerial Photo:	298_130, 131, 132	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	647 MBF Alt 3 1,294 MBF Alt 4 & 5
TM-Compartment and Stand:	6-40 & 7-121	**Volume Strata Acres:**	High 40 Medium 5 Low 0 Non-forest 1		

Existing Stand Condition: Understory Reinitiation

Silvicultural Prescription: Alt. 3 Two-aged management, 50% BA retention, clearcut with reserves.

Alt. 4 and 5 Even-aged management, clearcut.

Logging Method/ Transportation: Shovel / Two temporary roads

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class III, Channel Type HC5.
Stream 2 is Class IV, Channel Type HC5.
Stream 3 is Class III, Channel Type HC6.

Response: Streams 1 and 3: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 2: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Concern: Access road would cross a Class II stream.

Response: Install a log stringer bridge. Designate location of stream crossing and minimize stream channel disturbance from construction/decommissioning (BMPs 14.14; 14.17).

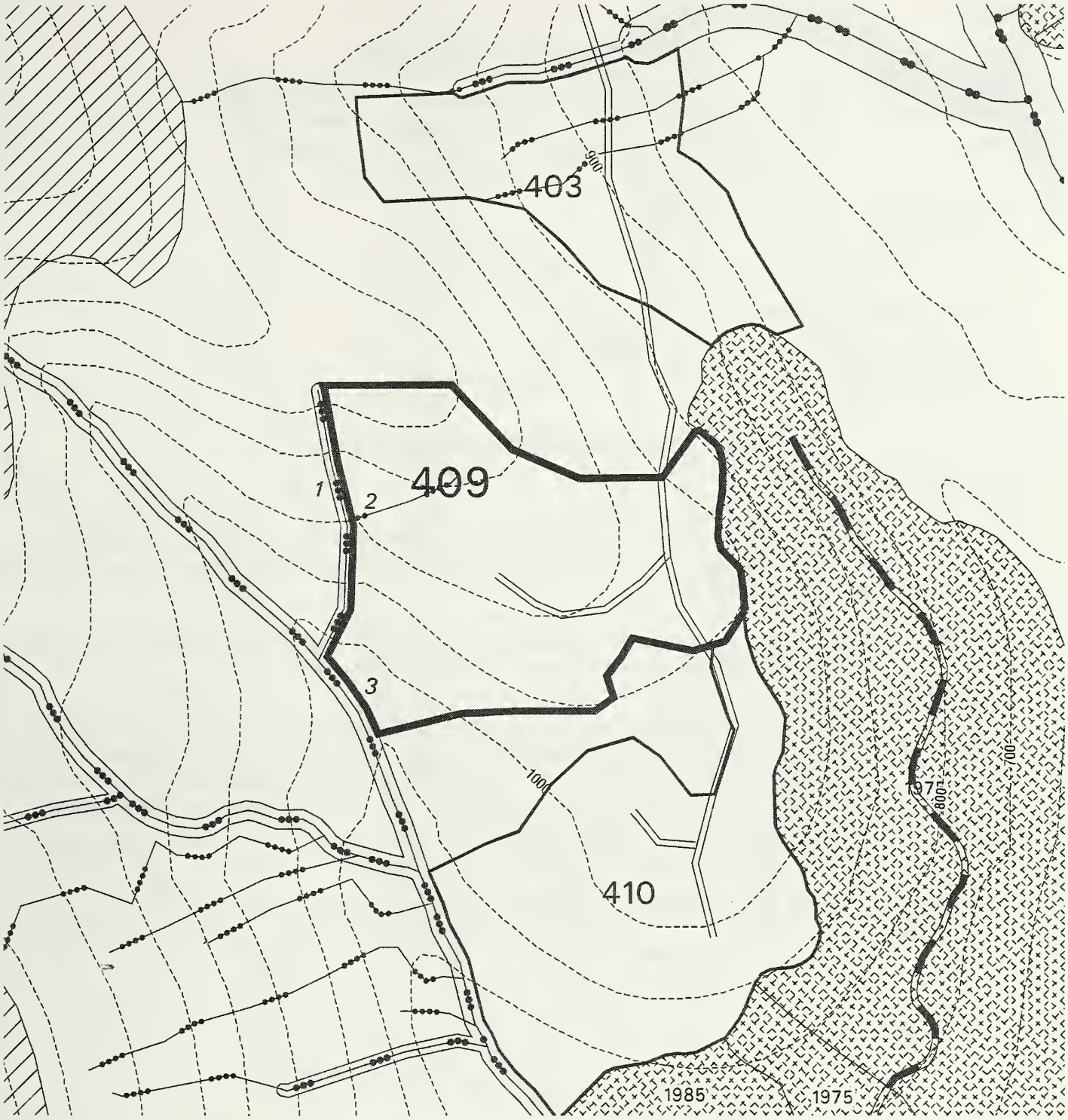
Wildlife/Biological Diversity

Concern: Wildlife corridor between two previously harvested units. High and medium Volstrata occur within this unit. 27 acres of medium value (HSI 4.0-5.0) deer habitat and 40 acres of high value marten (HSI >0.89) habitat occur within this unit.

Response: Travel corridor mitigated by 50% BA retention in Alternative 3. Alternatives 4 and 5 would remove travel corridor and harvest Volstrata and reduce deer and marten habitat values.

No resource concerns for: Soils, Wetlands, Karst, Scenery, Heritage, Vegetation

Kuiu Unit 409 Alternative 3,4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 409 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	410	**Unit Acres:**	45	**Alternatives:**	3, 4, 5
1999 Aerial Photo:	298_130, 131, 132	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	1,200 MBF
TM-Compartment and Stand:	6-41 & [illegible]2	**Volume Strata Acres:**	High 29 Medium 14 Low 1 Non-forest 1		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / Two temporary roads

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class III, Channel Type HC6.

Response: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Concern: Access road would cross a Class II stream.

Response: Install a log stringer bridge. Designate location of stream crossing and minimize stream channel disturbance from construction/decommissioning (BMPs 14.14; 14.17).

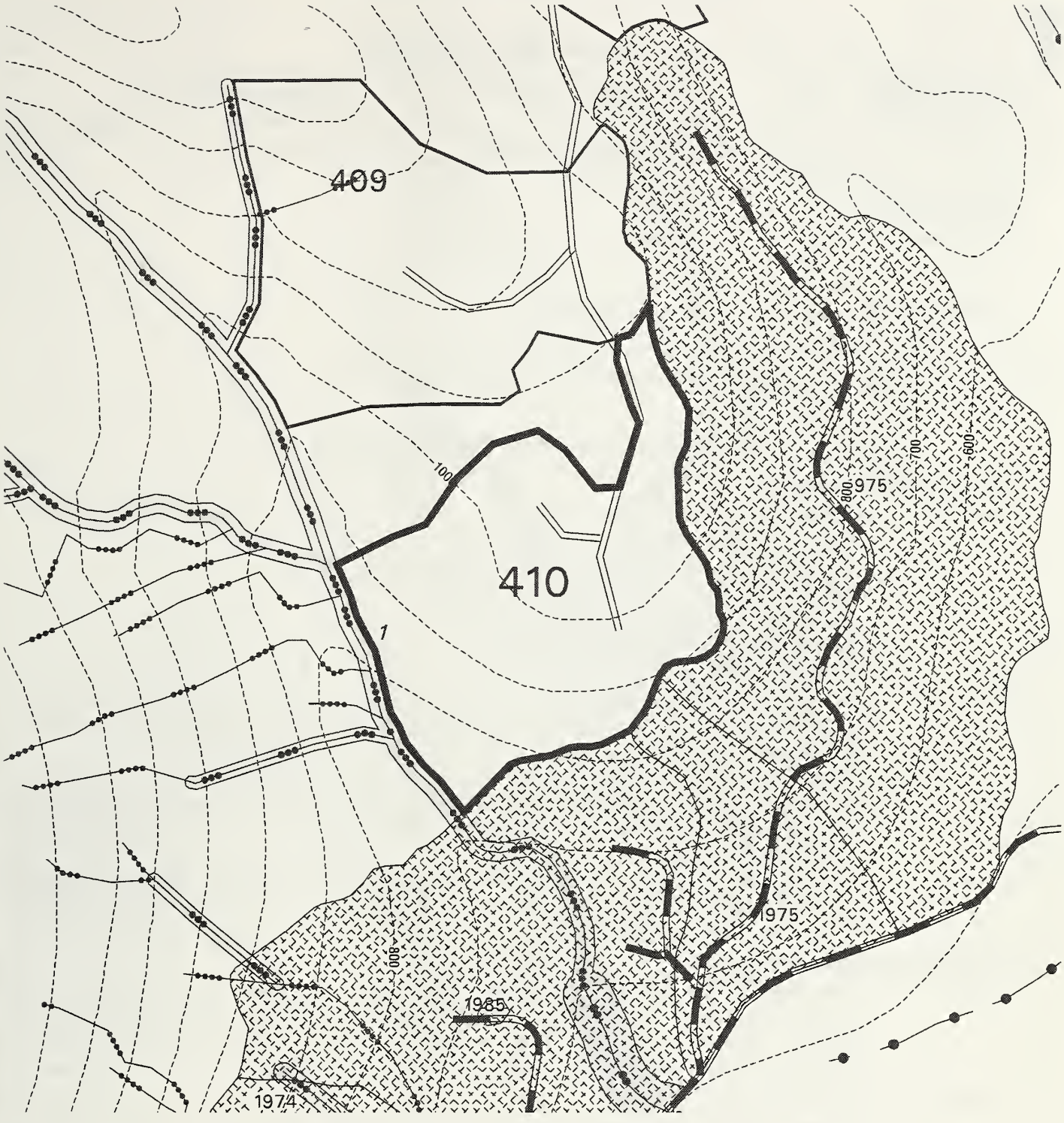
Wildlife/Biological Diversity

Concern: High amount of animal use was reported. Field crews noted red squirrel, black bear, deer, red-breasted sapsucker, and many neo-tropical migrant birds. Large amount of high and medium Volstrata in unit. 2 acres of high value (HSI >0.60), 21 acres of medium value (HSI 4.0-5.0) deer habitat along with 29 acres of high value marten (HSI >0.89) habitat occur within the unit.

Response: Clearcut harvest would remove all old-growth habitat and reduce the marten and deer habitat values. Clearcut harvest would not isolate habitat or eliminate corridor.

No resource concerns for: Soils, Wetlands, Scenery, Heritage, Vegetation, Karst

Kuiu Unit 410 Alternative 3,4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 410 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	412	**Unit Acres:**	99	**Alternatives:**	4, 5
1999 Aerial Photo:	298_132, 133, 134	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	2,874 MBF
TM-Compartment and Stand:	7-123	**Volume Strata Acres:**	High 93 Medium 6 Low Non-forest		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / One temporary road

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class IV, Channel Type HC2.
Stream reach 2 is Class II, Channel Type HC2.
Stream 3 is Rowan Creek, and is Class II, Channel Type MC2.
Stream reach 4 is Class II, Channel Type HC2.
Stream reach 5 is Class IV, Channel Type HC2.
Stream 6 is Class III, Channel Type HC5.
Stream 7 is Class III, Channel Type HC6.

Response: Streams 1 and 5: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Streams 2, 3, and 4: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Streams 6 and 7: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the RMA. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Wildlife/Biological Diversity

Concern: Black bear, red squirrel, deer, red-breasted sapsucker use and game trails were reported by field personnel. Brown Creepers were present and vocalizations were heard within the unit. Large amount of high Volstrata in unit. 50 acres of high value (HSI >0.60), 26 acres of medium value (HSI 4.0-5.0) deer habitat along with 93 acres of high value marten (HSI >0.89) habitat occur within the unit.

Response: Clearcut harvest would remove old-growth habitat and reduce deer and marten habitat values. Clearcut harvest would not isolate habitat and area is not an isolated corridor.

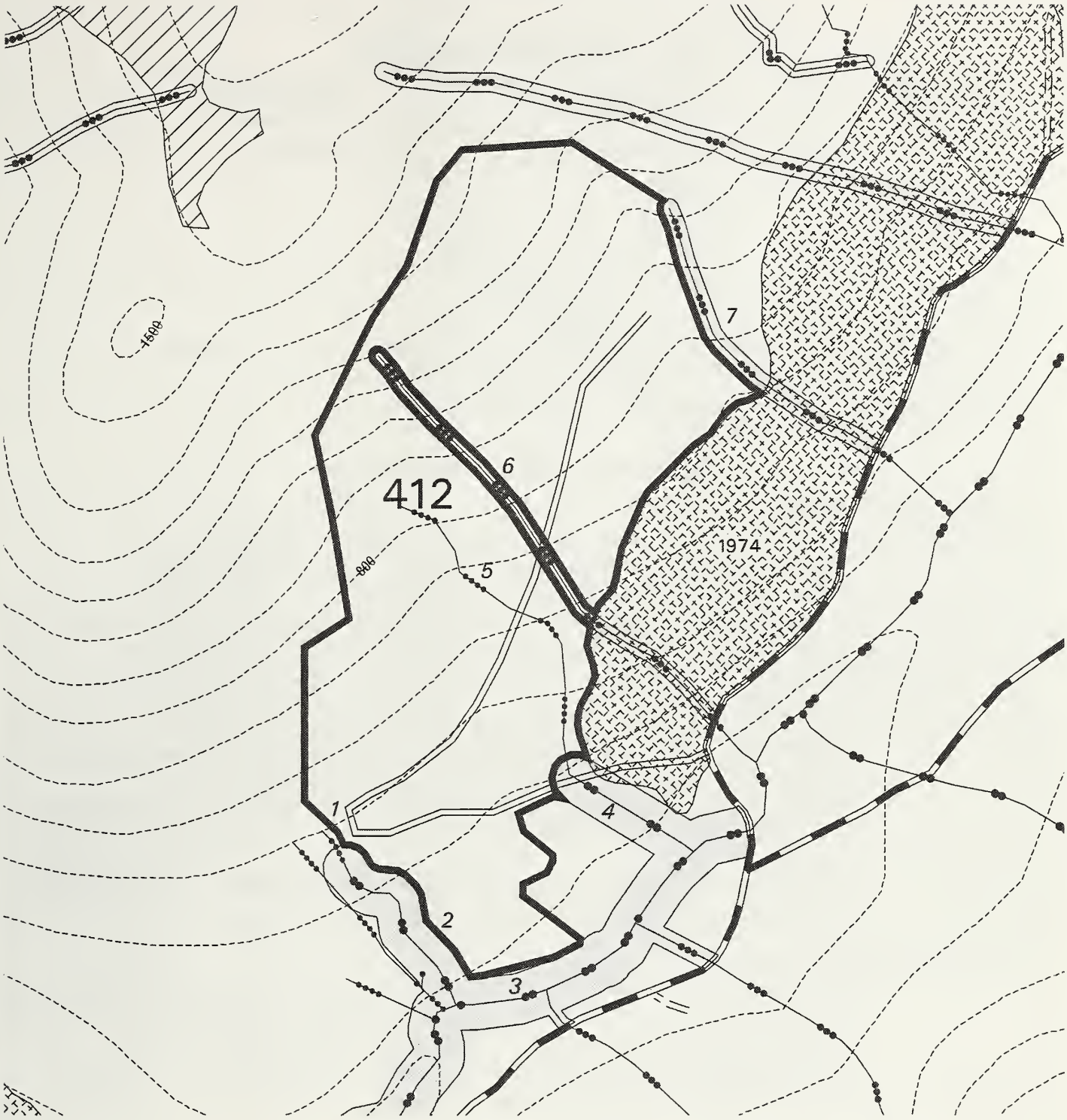
Vegetation/Timber

Concern: Even-aged opening size is close to 100 acres.

Response: During layout ensure harvest unit does not exceed 100 acres.

No resource concerns for: Soils, Karst, Wetlands, Scenery, Heritage

Kuiu Unit 412 Alternative 4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 412 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	414	**Unit Acres:**	72	**Alternatives:**	4
1999 Aerial Photo:	598_136, 598_137	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	1,053 MBF
TM-Compartment and Stand:	6-42	**Volume Strata Acres:**	High 72 Medium Low Non-forest		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Two-aged management, 50% BA retention, clearcut with reserves, 49 acres and uneven-aged management, 50% BA retention, group selection, 23 acres.

Logging Method/ Transportation: Cable / Three temporary roads

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Streams 1 and 4 are Class II Channel Type HC3, and Class II Channel Type HC5.
Streams 2 and 3 are Class III Channel Type HC3, and Class III Channel Type HC5.
Streams 5, 6, and 7 are Class IV, Channel Type HC5.

Response: Streams 1 and 4: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater.
Streams 2 and 3: No programmed commercial timber harvest within the RMA, which is defined as the V-notch.
Streams 5, 6, and 7: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Streams 1, 2, 3, and 4: Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Soils

Concern: Soil above, but outside of unit, is steep with evidence of past landslides.

Response: Locate Backline below steep areas and avoid unstable soil in V-notches.

Wildlife/Biological Diversity

Concern: Unit is a wildlife travel corridor between high and low elevations. Large amount of high Volstrata in unit. 51 acres of high value (HSI >0.60), 10 acres of medium value (HSI 4.0-5.0) deer habitat along with 69 acres of high value marten (HSI >0.89) habitat occur within the unit.

Response: 50% BA retention would mitigate harvest and help retain corridor and some old-growth characteristics as well as marten and deer habitat.

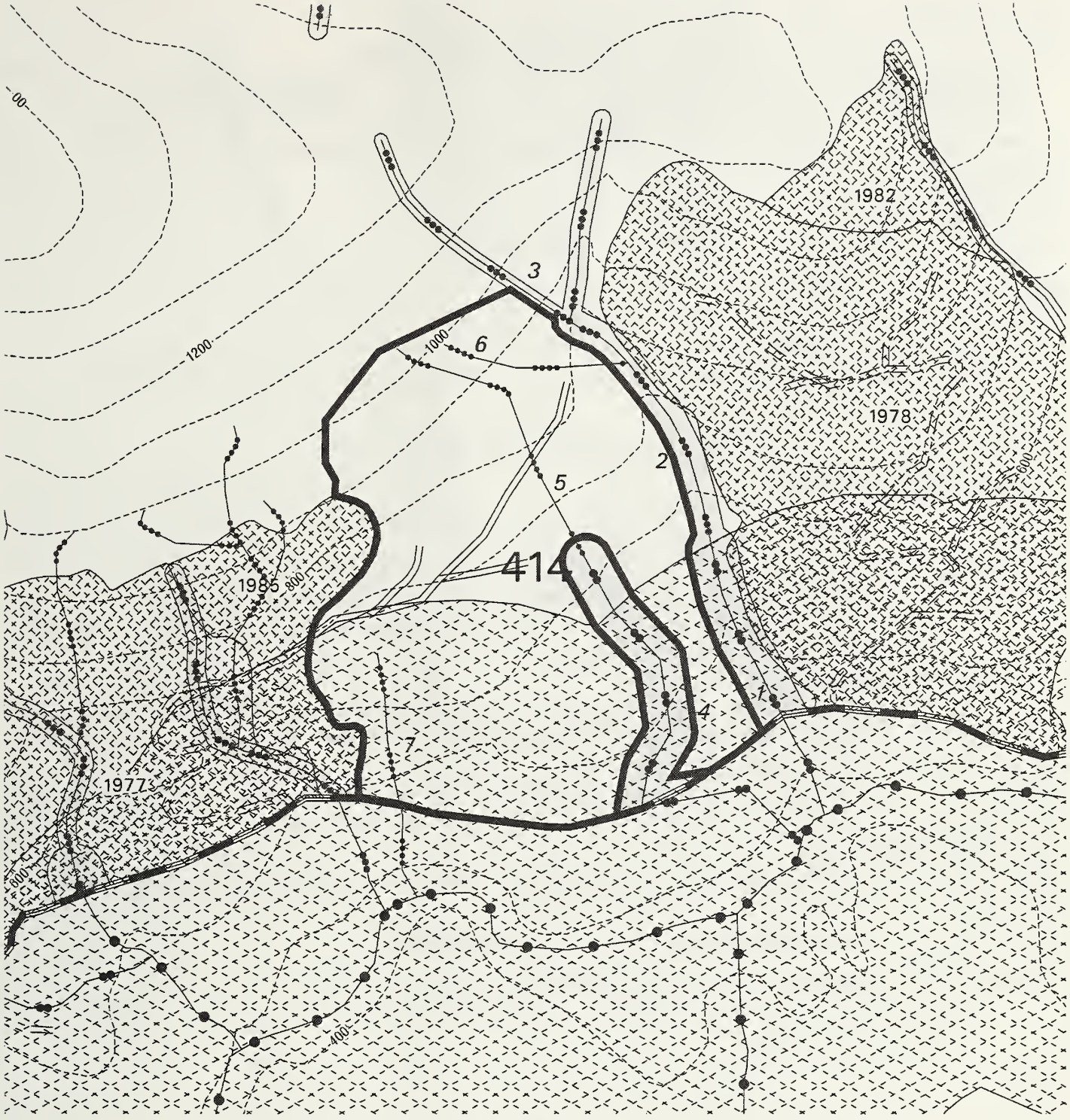
Recreation/Scenery

Concern: Lower portion of unit (31 acres) located within Forest Plan Recreational River land use designation.

Response: Landscape Architect would assist in marking and layout.

No resource concerns for: Heritage, Vegetation, Karst, Wetlands

Kuiu Unit 414 Alternative 4



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Recreational River Corridor
- Proposed Unit 414 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	415	**Unit Acres:**	27	**Alternatives:**	2, 4
1999 Aerial Photo:	598_95, 598_94	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	360 MBF
TM-Compartment and Stand:	6-43	**Volume Strata Acres:**	High 24 Medium 0 Low 3 Non-forest		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Two-aged management, 50% BA retention, clearcut with reserves

Logging Method/ Transportation: Cable and Shovel / One temporary road and existing Road 6415

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class I, Channel Type MC2 for the lower section and Class II, Channel Type MC2 for the upper section.

Response: Stream 1: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the channel, or to the top of the side-slope break, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Wildlife/Biological Diversity

Concern: Unit is wildlife travel corridor between high and low elevations. Large amount of high Volstrata in unit. 25 acres of high value (HSI >0.60) deer habitat and 25 acres marten value (HSI >0.89) habitat values occur within the unit.

Response: Retention of 50% BA would mitigate harvest by retaining some old-growth characteristics and maintain travel corridor as well as retain marten and deer habitat.

Recreation/Scenery

Concern: Lower portion of unit (18 acres) located within Forest Plan Recreational River land use designation.

Response: Landscape Architect would assist in marking and layout.

No resource concerns for: Soils, Karst, Wetlands, Heritage, Vegetation

Kuiu Unit 415 Alternative 2,4

- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Recreational River Corridor
- Proposed Unit 415 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	416	**Unit Acres:**	44	**Alternatives:**	2, 3, 4, 5
1999 Aerial Photo:	598_95, 598_94	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	1,262 MBF
TM-Compartment and Stand:	6-44	**Volume Strata Acres:**	High 43 Medium 0 Low 0 Non-forest 1		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / One temporary road and existing Road 46091

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class II, Channel Type MC2.
Stream 2 is Class IV, Channel Type HC5.
Stream 3 is Class IV, Channel Type HC5.

Response: Stream 1: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the channel, or to the top of the side-slope break, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Streams 2 and 3: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Wildlife/Biological Diversity

Concern: Unit has high Volstrata. 13 acres of high value (HSI >0.60) acres of medium value (HSI 4.0 to 5.0) deer habitat along with 25 acres of high value marten (HSI >0.89) habitat occur within the unit.

Response: Clearcut harvest would remove old-growth habitat and reduce deer and marten habitat.

No resource concerns for: Soils, Scenery, Heritage, Vegetation, Karst, Wetlands

Kuiu Unit 416 Alternative 2,3,4,5

- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 416 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	417	**Unit Acres:**	24	**Alternatives:**	2, 3, 5
1999 Aerial Photo:	198_70, 198_71	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	347 MBF Alt 3 695 MBF Alt 2 & 5
TM-Compartment and Stand:	7-124	**Volume Strata Acres:**	High 24 Medium 0 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Alt. 2, 5 Even-aged management, clearcut.

Alt. 3 Two-aged management, 50% BA retention, clearcut with reserves.

Logging Method/ Transportation: Cable / Existing Road 46094

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class III, Channel Type HC3
Streams 2, 3, and 4 are Class IV, Channel Type HC5.

Response: Stream 1: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 2, 3, and 4: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

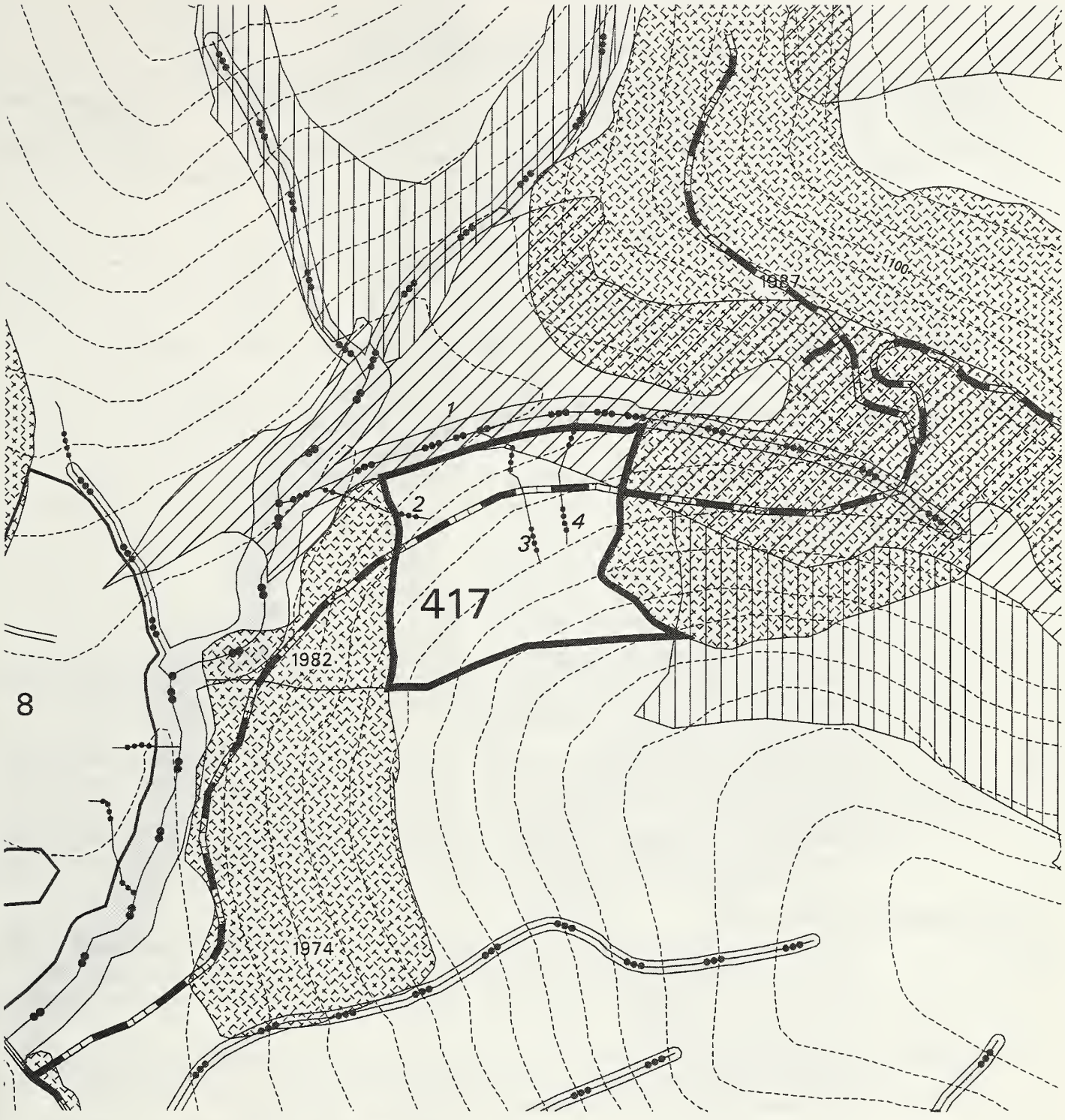
Wildlife/Biological Diversity

Concern: High amount of animal use was reported. High Volstrata exists within the unit. Area is wildlife travel corridor between high and low elevations. 3 acres of high value (HSI >0.60), 15 acres of medium value (HSI 4.0 to 5.0) deer habitat along with 24 acres of high value marten (HSI >0.89) habitat occur within the unit.

Response: 50% BA retention in Alternative 3 would mitigate the harvest of old-growth habitat by retaining corridor function and retaining some old-growth characteristics. Additionally, it would reduce the impacts to deer and marten habitat values. Even-aged prescriptions in alternative 2 and 5 would remove the travel corridor and all old-growth habitat reducing the marten and deer habitat values.

No resource concerns for: Soils, Wetlands, Karst, Scenery, Heritage, Vegetation

Kuiu Unit 417 Alternative 2,3,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 417 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	418	**Unit Acres:**	45	**Alternatives:**	2, 4, 5
1999 Aerial Photo:	198_70, 198_71	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	513 MBF Alt 2 1,028 MBF Alt 4, 5
TM-Compartment and Stand:	7-125	**Volume Strata Acres:**	High 17 Medium 12 Low 14 Non-forest 2		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: **Alt. 2** Two-aged management, 50% BA retention, clearcut with reserves.

Alt. 4, 5 Even-aged management, clearcut.

Logging Method/ Transportation: Shovel / One temporary road and existing Road 6402

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class II, Channel Type MC2.
Stream 2 is Class IV, Channel Type HC5.
Stream 3 is Class IV, Channel Type HC5.
Stream 4 is Class III, Channel Type HC5.

Response: Stream 1: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the channel, or to the top of the side-slope break, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Streams 2 and 3: Split yard away from Class IV streams whenever possible. Buck, limb, and top felled trees clear of streamcourses. Remove any slash deposited in streamcourse as a result of timber harvest activities. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Stream 4: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area.. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Wildlife/Biological Diversity

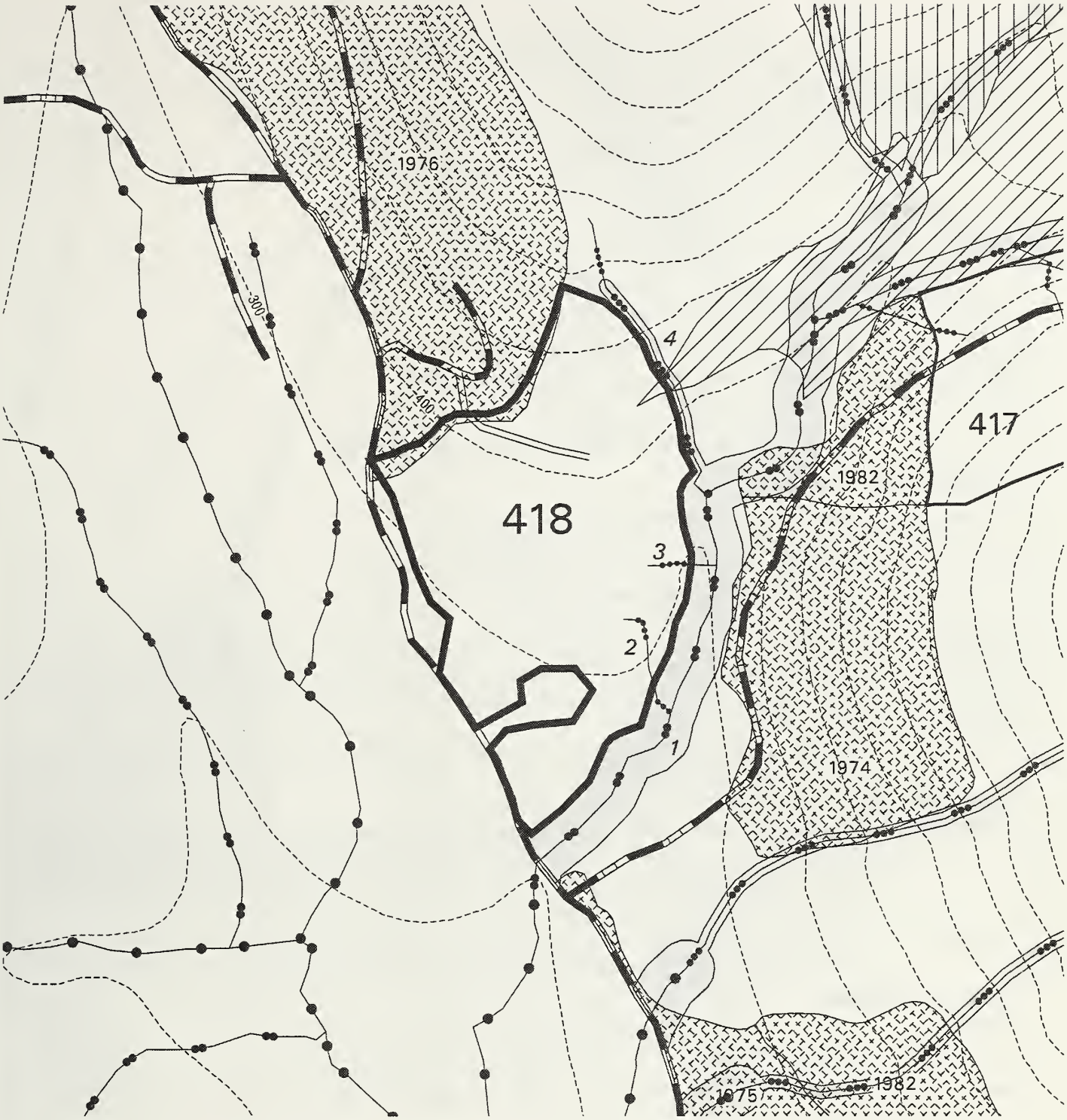
Concern: High amount of animal use was reported. High, medium and low Volstrata exists within the unit. Wildlife corridor exists between high and low elevations. 17 acres of high value (HSI >0.60), 11 acres of medium value (HSI 4.0 to 5.0) deer habitat along with 17 acres of high value marten (HSI >0.89) habitat occur within the unit.

Response: 50% BS retention in Alternative 2 would mitigate the harvest by retaining function of the travel corridor. Additionally, it would reduce the impacts to high volume old-growth by retaining some of the characteristics. Deer and marten habitat values would be retained.

Clearcut harvest in Alternatives 4 and 5 would remove all old-growth and remove the travel corridor. Marten and deer habitat would be reduced.

No resource concerns for: Scenery, Heritage, Soils, Vegetation, Karst, Wetlands

Kuiu Unit 418 Alternative 2,4,5



Existing Managed Stands
Riparian Management Area
Forest Plan Old-Growth Reserve
Extreme Hazard Soils
High Hazard Soils
Proposed Unit 418 Boundary
Adjacent Proposed Units
Stream Value Class I
Stream Value Class II
Stream Value Class III
Stream Value Class IV

Existing Open Roads
Closed Roads (Storage)
Decomissioned Roads
Proposed Roads
100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	503	**Unit Acres:**	95	**Alternatives:**	4, 5
1999 Aerial Photo:	198_102, 103, 104	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	2,637 MBF
TM-Compartment and Stand:	2-128	**Volume Strata Acres:**	High 65 Medium 30 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable / Two temporary roads

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream reach 1 is Class III, Channel Type HC6.
Stream reach 2 is Class II, Channel Type HC6.
Stream 3 is Dean Creek and is Class II, Channel Type HC3.
Stream 4 is Dean Creek and is Class III, Channel Type HC3.
Stream 5 is Class III, Channel Type HC5.

Response: Streams 1, 4, and 5: No programmed commercial timber harvest within the RMA, which is defined as within 100 feet of the stream or to the top of the V-notch, whichever is greater. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.
Streams 2 and 3: No timber harvest within 100 feet of stream, or within the v-notch (side slope breaks). Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

Wildlife/Biological Diversity

Concern: High animal use. High use of the game trails as a wildlife travel corridor exists between high and low elevations. Large amount of high and medium Volstrata would be harvested in this unit. 5 acres of high value (HSI >0.60), 67 acres of medium value (HSI 4.0 to 5.0) deer habitat along with 63 acres of high value marten (HSI >0.89) habitat within unit.

Response: Clearcut harvest would remove all old-growth habitat and reduce marten and deer habitat values. Travel corridors between low and high elevations will be eliminated by harvest of this unit.

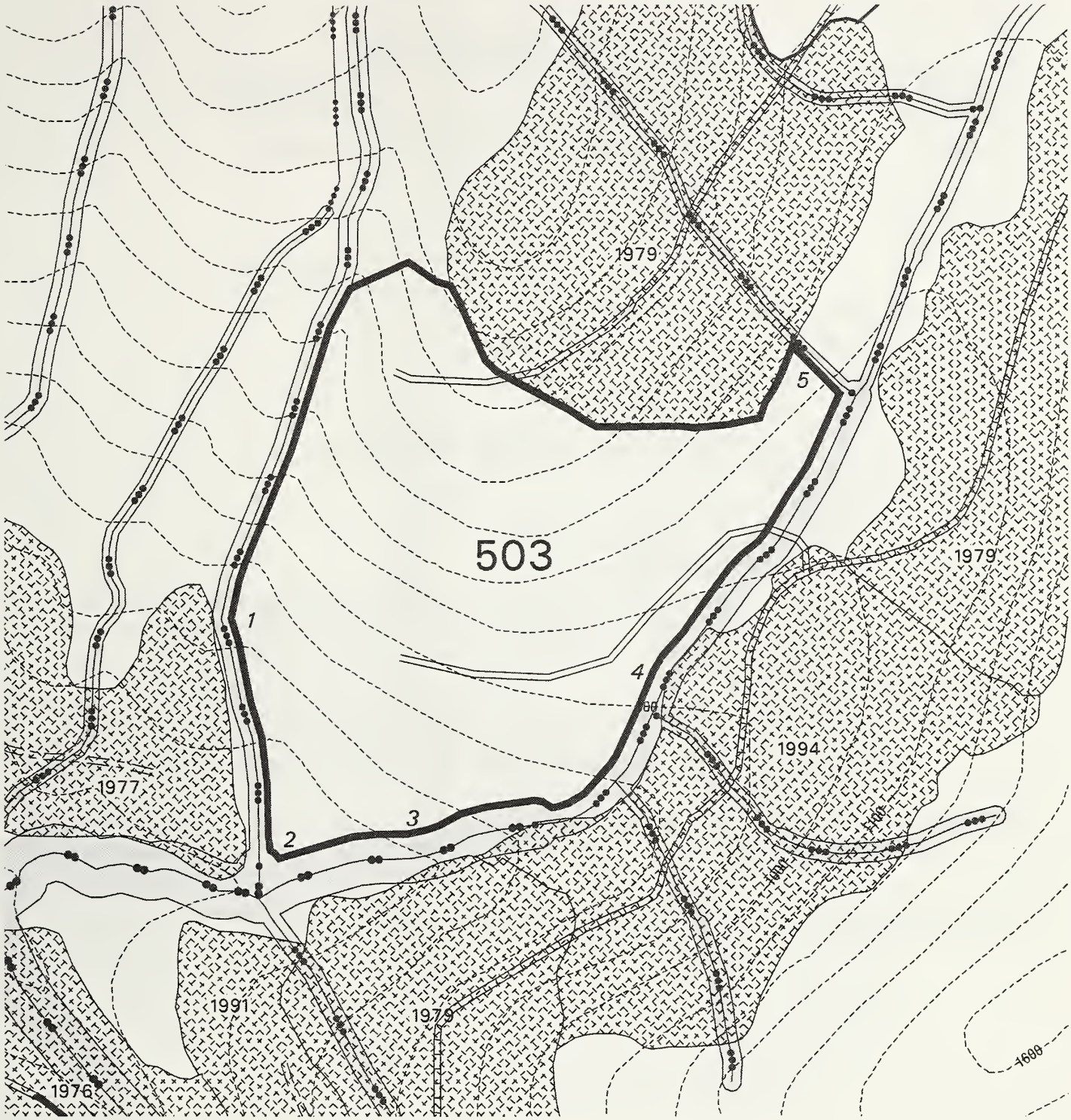
Vegetation/Timber

Concern: Even-aged opening size is close to 100 acres.

Response: During layout ensure harvest unit does not exceed 100 acres.

No resource concerns for: Soils, Wetlands, Karst, Scenery, Heritage

Kuiu Unit 503 Alternative 4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 503 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Kuiu Timber Sale Unit Card

Unit Number:	504	**Unit Acres:**	25	**Alternatives:**	4, 5
1999 Aerial Photo:	198_102, 198_103	**Land Use Designation:**	Timber Production	**Net Timber Volume:**	672 MBF
TM-Compartment and Stand:	2-129	**Volume Strata Acres:**	High 14 Medium 11 Low 0 Non-forest 0		

Existing Stand Condition: Understory reinitiation

Silvicultural Prescription: Even-aged management, clearcut

Logging Method/ Transportation: Cable/Existing Road 6427

Resource Concerns & Responses

Fish Habitat/Watershed

Concern: Stream 1 is Class III, Channel Type HC6
Stream 2 is Class III, Channel Type HC5
Stream 3 is Class III, Channel Type HC2

Response: All Streams: No programmed commercial timber harvest within the RMA, which is defined as the V-notch. Provide reasonable assurance of windfirmness of the riparian management area. Implement BMPs 12.6, 12.6a. 13.9, and 13.16.

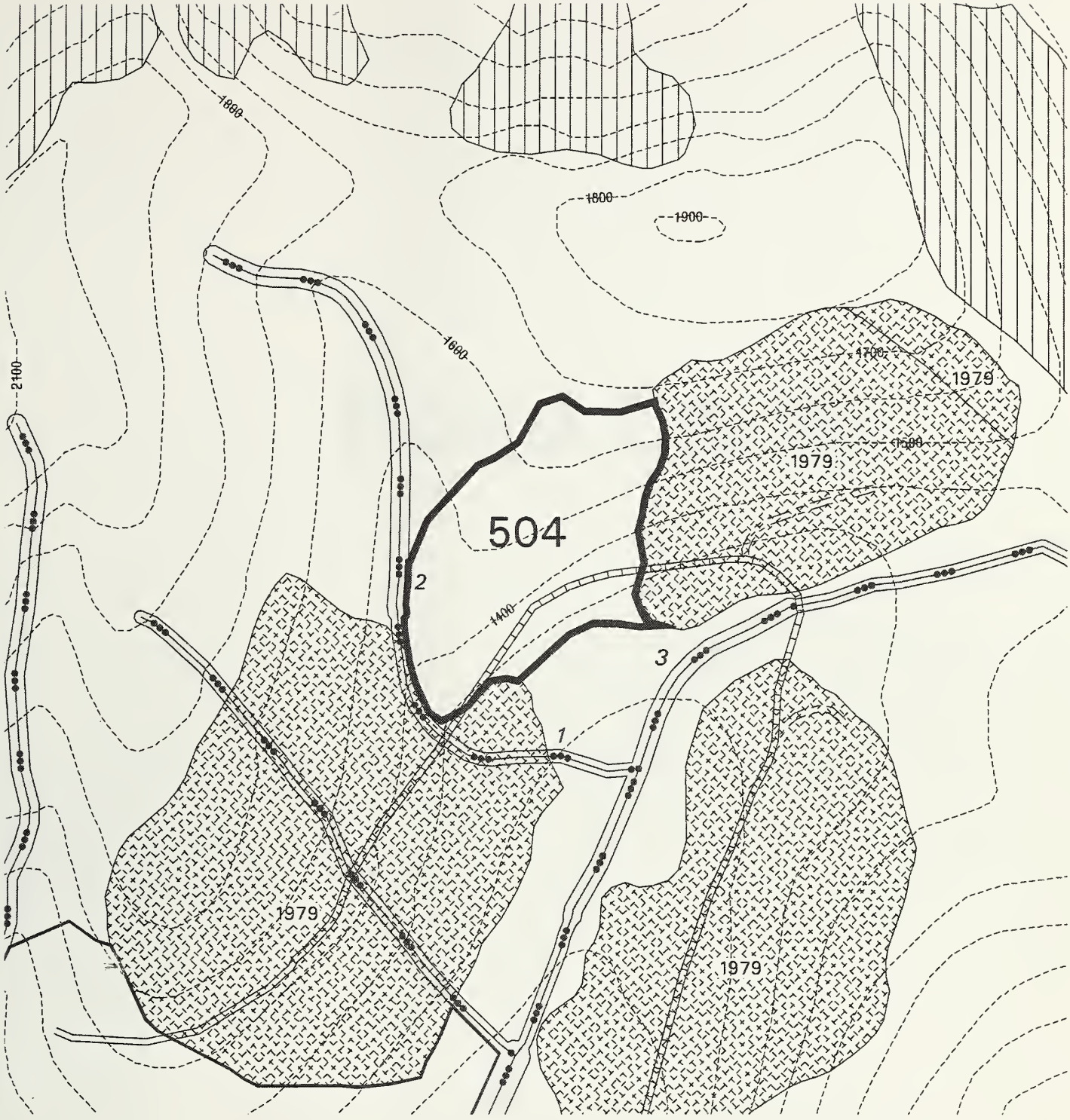
Wildlife/Biological Diversity

Concern: High animal use. High use of the game trails as a wildlife travel corridor between high and low elevation exists within this unit. Large amount of high and medium Volstrata would be harvested in this unit. 11 acres of medium value (HSI 4.0 to 5.0) deer habitat and 13 acres of high value marten (HSI >0.89) habitat occur within the unit.

Response: Clearcut harvest would remove all old-growth habitat and reduce the deer and marten habitat values. Travel corridors between low and high elevations would be eliminated by harvest of this unit.

No resource concerns for: Soils, Wetlands, Karst, Scenery, Heritage, Vegetation

Kuiu Unit 504 Alternative 4,5



- Existing Managed Stands
- Riparian Management Area
- Forest Plan Old-Growth Reserve
- Extreme Hazard Soils
- High Hazard Soils
- Proposed Unit 504 Boundary
- Adjacent Proposed Units
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Existing Open Roads
- Closed Roads (Storage)
- Decomissioned Roads
- Proposed Roads
- 100-ft. Contour Interval

N

0 660 1320

Scale is 1 inch = 660 feet

Road Cards

Road Management Objectives

Purpose and Use

The road management objectives (RMOs) presented in this appendix establishes the intended purpose and display design maintenance and operation criteria (as per FSH 7709.55) for each National Forest System road in the Kuiu Timber Sale Area. The information on the RMO form is part of a permanent database that can be updated periodically as access needs, issues, and budgets change. Proposed new roads and existing roads with planned reconstruction or maintenance have a second section with site specific design criteria that will be used during design, construction, and initial monitoring of any road work proposed in this document. See Figure B-2 for a map of the Kuiu Timber Sale Area showing existing road locations.

General Design Criteria

The general design criteria provide various descriptions of the type of road and the intended purpose and future use of the road. From this information, the maintenance and operation criteria can be developed. This information is critical for determining whether a Corps of Engineer's permit will be required for segments of road crossing wetlands. Roads built solely for silvicultural purposes do not require these permits.

Maintenance Criteria

The maintenance criteria include a discussion of how the road is to be maintained, centering on three strategies:

- **Active:** provide frequent cleanout of ditches and catch basins to assure controlled drainage. Control roadside brush to maintain sight distance. Grade as needed to maintain crown and running surface.
- **Storm Proof:** provide water bars, rolling dips, out sloping, etc., to assure controlled runoff until any needed maintenance can be performed on the primary drainage system. Control roadside brush to maintain passage.
- **Storage:** remove or bypass all drainage structures to restore natural drainage patterns, add water bars as needed to control runoff, revegetate.

The **active** maintenance strategy is applied to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. These roads are assigned Maintenance Level 3. The active maintenance strategy will also at times be applied to roads intended only for use by high clearance vehicles, or Maintenance Level 2 roads. This will usually be the case when log haul is expected in the near future.

An intermediate maintenance strategy is to **storm proof**, or stabilize the road by providing roadway features such as drivable water bars and out sloping to control runoff in case the primary drainage system

of culverts and ditches is overwhelmed during a storm event. Each culvert will be evaluated as to where the water would go if the culvert were to fail to carry the high flow. A water bar or out slope at this location will minimize the potential for erosion of long stretches of ditch line or roadway. This is intended to be the primary maintenance strategy applied to roads assigned Maintenance Level 2.

Storage is intended to be the primary maintenance strategy on intermittent use roads during their closure cycle. Road storage is defined in FSH 5409.17 as "the process/action of closing a road to vehicle traffic and placing it in a condition that requires minimum maintenance to protect the environment and preserve the facility for future use." In this strategy, the bridges and culverts on live streams are completely removed to restore natural drainage patterns. Cross drains and ditch relief culverts will be bypassed with deep water bars but may be left in place to minimize the cost of re-using these roads in the future. Roads in storage are left in a self-maintaining state in order to use more road maintenance funds on the open drivable roads on the island. Maintenance Level 1, closure and basic custodial maintenance, is assigned.

The interdisciplinary team went through a process to define road management considerations, leading to a maintenance strategy to be applied to each road in the Kuiu Timber Sale Area. Figure B-2 shows the desired future condition of each road in the project area as a result of the process. The work needed to meet the objectives can be accomplished on the roads along the haul route in these timber sales. Work needed on other roads to meet the desired objective will be scheduled as funding allows.

Operations Criteria

The operations criteria include a presentation of each of the five traffic management strategies identified in FSM 7731 (encourage, accept, discourage, prohibit, and eliminate) to be applied to different traffic classes on each road. The traffic management narrative describes what actions will be taken in order to apply each strategy. For example, if the strategy "eliminate" is prescribed for standard passenger and high clearance vehicles, the narrative describes the method to accomplish this, such as removal of stream crossing structures, gating, etc.

Site-specific Design Criteria

The site-specific design criteria include road location objectives, wetland information, erosion control, proposed rock borrow sources, and all streams within the project area with proposed construction or rehabilitation of stream crossing structures. Site-specific design criteria for the proposed reconstruction of classified roads for this project include timing restrictions for construction activities (Table B-3).

Table B-3. Stream classes, species of concern, and construction timing windows for stream crossings on classified roads proposed for reconstruction

ROAD #	MILE POST	STREAM CLASS	SPECIES OF CONCERN	CONSTRUCTION TIMING WINDOW
6417	0.119	II	CT	July 18 -- Aug 15
6417	0.789	II	DV	No restriction
6417	0.793	II	DV	No restriction
6417	0.925	I	SS, DV	June 1 -- Sept 1
6417	1.209	I	SS, CT, DV	July 18 -- Aug 15
6417	1.456	I	SH, PS, DV	July 18 -- Aug 1
6427	NONE	NONE	NONE	No restriction
46091	NONE	NONE	NONE	No restriction
46094	NONE	NONE	NONE	No restriction
6422	NONE	NONE	NONE	No restriction
6443	0.125	I	SS	June 1 -- Sept 1

CT = cutthroat, DV = Dolly Varden, SS = silver salmon, SH = steelhead, PS = Pink Salmon

Kuiu Timber Sale

Figure B-2

Proposed Road Maintenance Levels

Legend

- Productive Old-Growth
- Managed Stands
- Non-National Forest
- Lakes/Saltwater
- Project Area Boundary
- Suitable for Passenger Vehicles
- High Clearence Vehicles
- Basic Custodial Care (Closed)
- 500ft Contour Interval
- Stream Value Class I & II

Saginaw Bay

Keku Strait

Security Bay

Kadake Bay

N

0 0.5 1 2 3 4 Miles

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Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
6401	Bull Buck	6402 MP 10	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	1.03	Existing	PA D1 SW	'98 198-109.73

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Logging truck	Logging Truck

Intended Purpose/Future Use
Access for silvicultural activities.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	1.03	2		Active
0.00	1.03		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catchbasins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	N/A
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles

Travel Management Narrative
By removing stream crossing structures, most motorized vehicle use will be eliminated. Determined individuals may find a way to use off-road vehicles, but will be discouraged by the difficulty. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	ML OG RM SM TM

Route No	Route Name	Begin Terminus	End Terminus
6402	Kuiu Mainline	Saginaw Bay LTF	Apricot Creek

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	31.92	Existing	PA D1,C1, PB C6	'98 598-127-128, 298-123, 198-78, 105 to 112, 198-64 to 70, 298-138, 598-145 to 147, 83, 698-4, 69,798-196, 133, 13, 498-140, 139, 29, 30

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	16'	30	Lowboy	Lowboy

Intended Purpose/Future Use
Serves as main arterial road from Saginaw Bay to Threemile Arm, will remain open to all traffic to junction with 6434.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	28.75	3	3	Active
28.75	31.92	3	1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catchbasins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: Yes **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	All motorized vehicles on open segment
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Road will remain open to all traffic except for last 3 miles beyond road 6434. By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Determined individuals may find a way to use off-road vehicles, but will be discouraged by the difficulty. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
6403	Ledge Lake	6425 MP 5	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	0.37	Existing	PA D1 SW	'98 198-223

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Logging truck	Logging Truck

Intended Purpose/Future Use
Access for silvicultural activities, road will be closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	0.37	2		Inactive
0.00	0.37		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catchbasins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers
	Accept:	N/A
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles

Travel Management Narrative
By removing stream crossing structures, motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future..

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	OG TM

Route No	Route Name	Begin Terminus	End Terminus
6404	Rowan Bay	Rowan Bay Sortyard	6402 MP 14

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	4.43	Existing	PA C1 NW	'98 198-66, 118 to 122

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	16'	30	Lowboy	Lowboy

Intended Purpose/Future Use
Serves as main collector road from all roaded portions of Kuiu Island to Rowan Bay administration site.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	4.43	3	3	Active

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catchbasins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

Operation Criteria

Highway Safety Act: Yes **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	All motorized vehicles
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	N/A

Travel Management Narrative
Road will remain open to all traffic.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	OG TM

Route No	Route Name	Begin Terminus	End Terminus
6411	Ridge Top	6415 MP 15	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	0.80	Existing	PAD1 SE	'98 698-24

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Logtruck	Logtruck

Intended Purpose/Future Use
Access for silvicultural activities. Close road until needed in the future.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	0.80	2		Active
0.00	0.80		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catchbasins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
6413	South Fork Saginaw	6402 MP 2	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	2.84	Existing	PA D1 SE	'98 598-128 to 132

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Access for cultural activities.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	2.84	2		Active
0.00	2.84		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catchbasins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	All motorized vehicles on open segment
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Close road after timber harvest. By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	OG RR TM

Route No	Route Name	Begin Terminus	End Terminus
6415	Kuiu Connection	6402 MP 13	6402 MP 2

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	18.51	Existing	PA C1 NW, PA D1 SE, SW	'98 598-128, 103, 698-24, 50, 798-178 to 183, 698-57,16, 598-94, 137, 298-132 to 135

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	16'	30	Lowboy	Lowboy

Intended Purpose/Future Use
Serves as part of loop road on north Kuiu between Rowan and Saginaw bays.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	18.51	3	3	Active

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catchbasins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

Operation Criteria

Highway Safety Act: Yes **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	All motorized vehicles
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Keep road open to all traffic

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
6417	Security Bay Connection	6402 MP 7	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	3.67	Existing	PA D1 SW	'98 198-107, 108, 74, 298-127 to 129

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Access for silvicultural activities. Close road until needed in the future.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.000.	3.67	1		Closed
0.00	3.67		2	Active
0.00	3.67		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch[illegible]ns, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction: National Forest ownership**

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Close road after timber harvest. By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
[illegible]iu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
6418	Upper Saginaw Bay	6402 MP 3	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	1.70	Existing	PA D1 SW	'98 298-123, 124, 198-77

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Access for silvicultural activities. Close road until needed in the future.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	1.70	2		Active
0.00	1.70		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Close road after timber harvest. By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	RR

Route No	Route Name	Begin Terminus	End Terminus
6419	Long Muskeg	6415 MP 9	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	0.39	Existing	PA D1 SE	'98 798-181

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Access for silvicultural activities. Close road until needed in the future.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	0.39	2		Active
0.00	0.39		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	OG RR

Route No	Route Name	Begin Terminus	End Terminus
6421	Hoot Owl	6415 MP 7	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	0.46	Existing	PA D1 SE	'98 798-148

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Access for silvicultural activities. Close road until needed in the future.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	0.46	2		Active
0.00	0.46		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: **No** **Jurisdiction:** **National Forest ownership**

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
6422	Saginaw Bay	6417 MP 2	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	0.24	Existing	PA D1 SW	'98 198-73

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Access for silvicultural activities. Close road until needed in the future.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	0.24	1		Closed
0.00	0.24		2	Active
0.00	0.24		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Close road after timber harvest. By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
6425	Dean Creek	6402 MP 5	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	6.47	Existing	PA D1 SW, NW	'98 198-105, 104, 198-219 to 222, 198-100

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	16'	20	Lowboy	Lowboy

Intended Purpose/Future Use
Access for silvicultural activities. Close road at junction with road 46251until needed in the future.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	4.76	2	2	Active
4.76	6.47	2	1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: Yes **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	All motorized vehicles on open segment
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project		System	Land Use Designation
Kuiu		Kuiu	TM
Route No	**Route Name**	**Begin Terminus**	**End Terminus**
6427	Security Bay	6425 MP 2	
Begin MP	**Length**	**Status**	**Map Quarter Quad**	**Photo year, roll, photos**
0.00	3.44	Existing	PA D1 SW	'98 198-103, 104, 81

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Access for silvicultural activities. Close road until needed in the future.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	3.44	1		Closed
0.00	3.44		2	Active
0.00	3.44		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles on open segment
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Close road after timber harvest. By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
6441	Cedar Bight	6425 MP 3	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	1.73	Existing	PA D1 SW	'98 198-220, 298-6

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	1.73	2		Active
0	1.73		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: Yes **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
6442	Hernandez	6441 MP 0.5	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	0.75	Existing	PA D1 SW	'98 198-219

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	0.75	2		Active
0.00	0.75		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
6443	Tangle Foot	6417 MP 2	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	1.30	Existing	PA D1 SW	'98 198-74, 298-127

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	1.30	1		Closed
0.00	1.30		2	Active
0.00	1.30		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: Yes **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Close road after timber harvest. By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
6448	Saginaw Camp	Saginaw Bay LTF	Pentilla's Camp

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	0.81	Existing	PA D1 SW	'98 598-126, 298-119

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	16'		Lowboy	Lowboy

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	0.81	2	2	Active

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	All motorized vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	N/A

Travel Management Narrative
Road will remain open to all traffic

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
46021	Security Ridge	6402 MP 4.59	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	1.38	Existing	PA D1 SW	'98 198-78, 106

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity. Serves as telephone receiving area.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	1.38	2		Active
0.00	1.38		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Close road after timber harvest. By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project			System	Land Use Designation
Kuiu			Kuiu	RR TM
Route No	**Route Name**		**Begin Terminus**	**End Terminus**
46091	Wilder		6415 MP 5	
Begin MP	**Length**	**Status**	**Map Quarter Quad**	**Photo year, roll, photos**
0.00	1.58	Existing	PA D1 SE	'98 598-94, 95

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	1.58	1		Closed
0.00	1.58		2	Active
0.00	1.58		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies

Encourage:	Hikers, bicycles
Accept:	High clearance vehicles when open
Discourage:	N/A
Prohibit:	N/A
Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Close road after timber harvest. By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
46094	Burke Wind	6402 MP 13	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	1.58	Existing	PA C1 NW, PA D1 SW	'98 198-69, 70, 71

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	4.58	1		Closed
0.00	4.58		2	Active
0.00	4.58		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies

Encourage:	Hikers, bicycles
Accept:	High clearance vehicles when open
Discourage:	N/A
Prohibit:	N/A
Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Close road after timber harvest. By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
46096	Shorty	6413 MP 2	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	3.80	Existing	PA D1 SW, SE	'98 598-132, 198 to 102

General Design Criteria and Elements

Functional Class	Service Li	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	3.80	2		Active
0.00	3.80		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Close road after timber harvest. By removing stream crossing structures on closed segment, most motorized vehicle use will be eliminated. Restore stream crossings and re-use ditch relief culverts when the road is needed in the future.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
46098	Bulle Head	6425 MP 2	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	0.42	Existing	PA D1 SW	'98 198-218

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	0.42	2		Active
0.00	0.42		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies

Encourage:	Hikers, bicycles
Accept:	High clearance vehicles when open
Discourage:	N/A
Prohibit:	N/A
Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
0.00	1.43	Existing	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
46127	Saginaw	6415 MP 10	PA D1 SE	'98 698-51

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	1.43	2		Active
0.00	1.43		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	RR TM

Route No	Route Name	Begin Terminus	End Terminus
46152	North West Kadake Slope	6415 MP 6	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	2.05	Existing	PA D1 SE	'98 698-16, 17, 56

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	2.05	2		Active
0.00	2.05		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles when open
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
46154	North West Kadake Ridge	46152 MP 1	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	0.54	Existing	PA D1 SE	'98 698-17

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	0.54	2		Active
0.00	0.54		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies

Encourage:	Hikers, bicycles
Accept:	High clearance vehicles when open
Discourage:	N/A
Prohibit:	N/A
Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
46251	Cool Lake	6425 MP 5	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	2.13	Existing	PA D1 NW, SW	'98 198-222, 99, 83

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	1.02	2	2	Active
1.02	2.13	2	1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	TM

Route No	Route Name	Begin Terminus	End Terminus
46252	North Cool Lake	46251 MP 1	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	1.10	Existing	PA D1 SW, NW	'98 198-84, 99

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	1.10	2		Active
0.00	1.10		1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies

Encourage:	Hikers, bicycles
Accept:	High clearance vehicles when open
Discourage:	N/A
Prohibit:	N/A
Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Road Management Objective

Project	System	Land Use Designation
Kuiu	Kuiu	OG TM

Route No	Route Name	Begin Terminus	End Terminus
45420	Contraversy	6415 MP 16	

Begin MP	Length	Status	Map Quarter Quad	Photo year, roll, photos
0.00	2.27	Existing	PA D1 SE	'98 698-22, 23, 24

General Design Criteria and Elements

Functional Class	Service Life	Surface	Width	Design Speed	Critical Vehicle	Design Vehicle
Local	LI	Shot rock	14'	10	Log truck	Log truck

Intended Purpose/Future Use
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Maintenance Criteria

Bmp	Emp	Operational Maintenance Level (Planned Initial Condition)	Objective Maintenance Level (Desired FutureCondition)	Alaska Forest Practices Act Class
0.00	1.88	2	2	Active
1.88	2.27	2	1	Closed

Maintenance Narrative
AFR&P Reg's. "active" status: Keep culverts, catch basins, ditches and road blocks functional. Grade as needed to maintain crown and running surface.

AFR&P Reg's. "closed" status: Place road in storage. Remove culverts from streams, bypass ditch relief culverts with waterbars, add extra waterbars as needed to control runoff.

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership

Traffic Management Strategies	**Encourage:**	Hikers, bicycles
	Accept:	High clearance vehicles on open segment
	Discourage:	N/A
	Prohibit:	N/A
	Eliminate:	Motorized vehicles on closed segment

Travel Management Narrative
Local road used for silvicultural activities, will be opened periodically, closed during times of inactivity.

Appendix C

Watershed Analysis for the Kuiu Landscape Assessment

APPENDIX C

TABLE OF CONTENTS

1.1 Introduction

The Tongass Land and Resource Management Plan (USDA Forest Service, 1997) guides the management of soil and water resources on the Tongass National Forest. Specific Standards and Guidelines direct the inventory, analysis, protection, and improvement of soil, water, and riparian resources. These Standards and Guidelines prescribe general and specific procedures for the protection of stream channels during planning and implementation of timber sales, road building, mining, recreation, and special uses projects.

General direction for soil and water resources includes:

- Avoiding irreversible or serious and adverse effects on soil and water resources
- Maintaining water quality and quantity to protect the state-designated beneficial uses
- Applying Best Management Practices (BMPs) to all land-disturbing activities
- Reserving both ground and surface water rights (including for in-stream flow needs, and developed recreation sites)

General direction for riparian resources and associated stream channels includes:

- Maintaining riparian areas in mostly natural conditions
- Defining Riparian Management Areas and management prescriptions based on stream value classes for fish habitat and stream channel types

Refer to the Tongass Land and Resource Management Plan (USDA Forest Service, 1997) for specific Standards and Guidelines for soil and water (pp 4-83 – 4-85) and riparian resources (pp 4-53 – 4-73).

The Tongass Land and Resource Management Plan, Appendix J, defines the purpose and intent of watershed analyses on the Tongass National Forest. Watershed analysis is a procedure for assessing important riparian and aquatic habitat values and geomorphic processes within a watershed. It describes key aquatic and riparian resources, along with their habitat conditions and trends, and is designed to: (1) help set the stage for project planning, (2) strengthen the project NEPA analysis, and (3) focus interdisciplinary discussion on key watershed-level resources, habitat relationships and management issues.

1.2 Watershed Delineation and Identification

Watersheds are topographically delineated catchments drained by a single stream or river. Watersheds located on the islands of the Alexander Archipelago of Southeast Alaska are often small relative to watersheds draining continental land masses. Sea level often defines an appropriate downstream boundary to the small watersheds draining the many islands of the Alexander Archipelago. Larger watersheds may be divided into sub-watersheds either to achieve consistency in sizing analysis areas, or to acknowledge differences in the abiotic and biotic characteristics of these smaller catchments.

The Tongass National Forest recognizes the US Geological Survey (USGS) hierarchical watershed mapping and numbering system, and the numbering system used in the *Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fish*, which is maintained by Alaska Department of Fish and Game (State of Alaska, 1998). Under the USGS system watersheds are grouped and numbered according to successively smaller levels including regions, sub-regions, basins, sub-basins, watershed associations, and watersheds. Watershed numbers are called Hydrologic Unit Codes (HUC). The ADF&G Catalog of Waters is a hierarchical system of numbering streams and watersheds according to the saltwater bodies they drain into. These numbers are useful for categorizing watersheds which have known anadromous fish populations.

The Tongass National Forest maintains a Geographical Information System (GIS) that maps and identifies every major watershed on the Forest. The HUC system is used primarily as a tool for mapping watersheds and accomplishing GIS queries, whereas the ADF&G Catalog of Waters is often used as a labeling system for major watersheds that are drained by an unnamed stream.

For the following analysis, 6^{th} level HUC watersheds were queried from the Tongass GIS library. Each watershed was given a new number between 1 and 163 (Figure C-1). The renumbering of watersheds for this analysis was necessary because Hydrologic Unit Codes and ADF&G stream numbers are too long to be displayed on a map scaled to fit the entire Kuiu Island. This document also refers to watersheds by the names of major streams in cases where watersheds are drained by named major streams.

1.3 Watershed Characterization

Watersheds are characterized by a host of physical factors, including:

- Location
- Climate
- Geology
- Hydrology
- Stream channel morphology
- Disturbance regimes
- Protected beneficial uses and water rights
- Water quality
- Erosion and mass movement hazard
- Landslide inventory
- Harvest history
- Roads
- Sediment Risk
- Stream channel condition
- Fish habitat condition

The Tongass GIS library was used extensively for summarizing the large amounts of information that were required for this report. Watersheds were delineated, identified, and characterized using information queried from the Tongass GIS library. The GIS was particularly useful in characterizing watersheds according to geology, stream channel morphology, harvest history, roads, and landslide potential. The Tongass GIS library is constantly improving as field going personnel update information based on field observations.

1.4 Stream Channel Classification

The Tongass National Forest defines stream channels according to the Channel Type User Guide (USDA Forest Service, 1992), the foundation upon which aquatic habitat management prescriptions are developed. Channel types are defined within the context of fluvial process groups that describe the interrelationship between watershed runoff, landform relief, geology, and glacial or tidal influences on fluvial erosion and deposition processes. Individual channel type classifications are defined by physical attributes, such as channel

gradient, channel width, channel pattern, stream bank incision and containment, and riparian plant community composition (Table C - 1).

Table C - 1: Stream process groups and channel types recognized on the Tongass National Forest

Process Group	Process group abbreviation	Defining characteristic of group
Alluvial Fan	AF	Channels occurring on alluvial fan landforms
Estuarine	ES	Channels that are influenced by tides
Floodplain	FP	Low-gradient channels on broad flood plains
High-gradient Contained	HC	High-gradient channels contained by steep valley walls
Moderate Gradient Contained	MC	Moderate-gradient channels contained by steep valley walls
Moderate-gradient, Mixed-control	MM	Moderate-gradient channels with some flood plain development
Large Contained	LC	Large, low-gradient channels contained by steep valley walls
Glacial Outwash	GO	Channels associated with glaciers or recently glaciated terrain
Palustrine	PA	Very low-gradient, placid channels draining wetlands

Streams on the Tongass National Forest are also classified by stream value classes. Stream value classes are mapping units that indicate levels of habitat use by fish populations according to the following criteria described in the Aquatic Habitat Management Handbook (USDA Forest Service, 2001a).

Class I - Streams and lakes with anadromous or adfluvial fish or fish habitat; or high quality resident fish waters, or habitat above fish migration barriers known to be reasonable enhancement opportunities for anadromous fish.

Class II - Streams and lakes with resident fish or fish habitat and generally steep (6-25 percent or higher) gradient (can also include streams with a 0-6 percent gradient) where no anadromous fish occur, and otherwise not meeting Class I criteria.

Class III – Streams are perennial and intermittent streams that have no fish populations or fish habitat, but have sufficient flow or sediment and debris transport to directly influence downstream water quality or fish habitat capability. For streams less than 30 percent gradient, special care is needed to determine if resident fish are present.

Class IV - Other intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to have immediate influence on downstream water quality or fish habitat capability. Class IV streams do not have the characteristics of Class I, II, or III streams, and have a bankfull width of at least 0.3 meters (1 foot).

Non-streams: Rills and other watercourses, generally intermittent and less than 1 foot in bankfull width, little or no incision into the surrounding hillslope, and with little or no evidence of scour.

1.5 Watershed Processes and Forest Management

Collection

Watersheds function to collect and store precipitation, and deliver water to stream systems (Black, 1997). Natural factors that affect the collection of water by a watershed include storm characteristics such as size, position within the watershed, and the precipitation type and frequency.

Forest management activities have the potential to change patterns of water collection by changing patterns in canopy interception. Interception loss is the process by which precipitation is collected on the leaves and stems of vegetation and evaporates before reaching the soil surface (Dingman 2002). Interception loss is decreased following the removal of trees, and this increases the amount of water collected in the soil. Forest clearings associated with timber harvest interact with wind velocity patterns to cause increased snow deposition in small clearings, although this effect can be reversed in large openings. Watershed-scale experiments have shown that both selective logging and clearcutting tend to increase snow collection (Dingman 2002).

Storage

Watersheds function to store water in a variety of reservoirs, including soil-water, groundwater, lakes, ponds, wetlands, stream channels, and snowpack (Black, 1997). The soil mantle, in particular, constitutes the chief aquifer for water storage (Hewlett and Hibbert, 1963).

Roads can potentially reduce the storage capacity of a watershed by compacting the soil, and by increasing the stream drainage network into road ditches, allowing the soil water to be drained more quickly (Harr *et al.*, 1975; Jones and Grant, 1996; Jones *et al.*, 1999; Jones 2000).

Discharge

Stream discharge, or runoff, arises from four primary sources: direct precipitation into stream channels, interflow occurring within the soil mantle, base flow occurring within groundwater reservoirs, and overland flow (Hewlett and Hibbert, 1967). Overland flow is quickly routed towards stream channels, whereas interflow and base flow can have long or very long residence times in the soil mantle and in underground aquifers. Overland flow is rare in undisturbed forest soils where infiltration capacity exceeds precipitation rates, but more common where soil is compacted (Swanston and Marion, 1991). Typically, subsurface flows (interflow and base flow) account for the majority of stream flows (Hewlett and Hibbert, 1967).

Changes in the collection and storage of water in watersheds can affect the timing of stream discharge (Jones, 2000). Soil compaction in areas adjacent to streams or along roads with ditches leading to streams can increase the occurrence of overland flow. The resulting increase in the proportion of water delivered to streams by overland flow can cause streams to rise in response to rain fall or snow melt more quickly than would occur under natural conditions (Jones, 2000).

Changes in collection and storage of water in watersheds can also affect the amount of stream discharge (Jones, 2000). Increased snow loading primarily affects stream discharge during rain on snow precipitation events, or during spring thaw (Jones, 2000). During the growing season transpiration by plants (primarily trees) removes water stored in the soil mantle. Extensive reductions in plant transpiration rates by vegetation removal can increase annual water yield as well as peak flows in small streams, particularly during the driest part of the growing season (Harr *et al.*, 1975; Jones and Grant, 1996). Peak flow increases have been demonstrated in small watersheds where as little as 25 percent of vegetation has been completely removed in a single entry (Jones and Grant, 1996), however, increases may be undetectable when harvest levels are below 25 percent (Jones and Grant, 1996; Beschta *et al.*, 2000). Hydrologic recovery due to regrowth of vegetation in harvested areas offsets changes to peak flow increases over time. Full hydrologic recovery in the absence of roads is dependent upon regrowth following harvest, and is expected to require between 10 and 30 years in the Pacific Northwest (Hicks *et al.*, 1991; Jones 2000).

Increased drainage density in road ditches, and subsurface flow interception in road cuts can potentially increase peak flows, including large flow events with recurrence intervals of one year or greater, and

change the timing of runoff (Harr *et al.*, 1975, Jones 2000). The effects of subsurface flow interception by roads increase as the percentage of area in roads and road density within the watershed, particularly on mid-slopes, increases (Harr *et al.*, 1975, Jones 2000). A study conducted in the Oregon Coast Range indicates that increases in peak flows occur when at least 12 percent of the watershed area is cleared for roads (Harr *et al.*, 1975). Hydrologic changes caused by roads may require several decades to recover (Jones, 2000).

Disturbance regimes

The most important natural disturbances in watersheds of the Tongass are soil mass movement, flooding, and windthrow. Forest pathogens and fire also affect forest dynamics to a lesser extent. Soil mass movement shapes the steep slopes and upper valleys of these watersheds, and provides a sediment source for streams. Flooding shapes the valley bottoms and deposits alluvium on floodplains. The uprooting of trees by wind stirs soil and determines the structure of the forest canopy.

Mass movement events such as landslides and debris torrents are primary sources of sediment input for streams in the Pacific Northwest, including Southeast Alaska (Swanston and Marion 1991; Swanson *et al.*, 1987). However, increased rates of mass movement can alter stream morphology and adversely affect fish populations (Sullivan *et al.*, 1987; Swanson *et al.*, 1987). Natural landslides are linked to initiation by temporary water table development during high intensity storms. Forest harvest operations in southeast Alaska have increased the frequency of landslide events (Swanston and Marion, 1991). Increased landslide activity is linked to alterations in ground water/surface water flow regimes and the destruction of stabilizing root systems due to timber harvest. Activities that increase the availability of soil water (such as increased snow loading and decreased transpiration loss), can potentially increase the frequency and duration of soil saturation (Satterlund and Adams, 1992), thereby increasing the susceptibility of a slope to failure. In a study in southeast Alaska, logging substantially increased the number of landslides initiating from gullies (v-notches) present before logging, possibly reflecting the increased disturbance of gully walls and loading of the gully floor with soil and organic debris during yarding operations (Swanston and Marion, 1991). Research concerning landslides in Southeast Alaska provided information that was used in the development of the standards and guidelines in the Forest Plan.

Sediment transport in streams

For a stream channel to maintain a stable form, there must be a balance, at a given location, between the amount of sediment supplied and the capacity of the stream to transport sediment, otherwise aggradation or degradation occurs (Montgomery and Buffington, 1998). Hill slopes and headwater streams act as sediment sources, intermittently delivering pulses of sediments to streams through debris

flow events. Steep, narrow stream channels immediately downstream from source areas readily transport sediment inputs through the stream network to larger, lower-gradient streams, where the response to sediment input is governed by the transport capacity of the stream at a given location (USDA Forest Service, 1992; Montgomery and Buffington, 1997). The transport capacity of a stream is affected by stream discharge, gradient, bed roughness, channel geometry, and sediment size.

Stream flow directly influences sediment transport and bed stability, and controls the depth of bed scouring (Montgomery and Buffington, 1998). Due to the relationship between stream flow event frequency and magnitude, the largest portion of the total load is carried by flows which occur on the average once or twice a year (Wolman and Miller, 1960).

Where transport capacity is limited, stream reaches are particularly susceptible to impacts from accelerated sediment supply (USDA Forest Service, 1992; Montgomery and Buffington, 1997). Increased rates of sediment supply can lead to bed surface fining, smoothing of stream channels, and filling of pools (Sullivan *et al.*, 1987; Madej, 1999). The most susceptible stream reaches tend to be in valley bottoms (USDA Forest Service, 1992; Montgomery and Bufington, 1997), areas that are commonly of the greatest importance to fish as spawning habitat.

1.6 Watershed Analysis Tools and Techniques

Intensity of watershed analysis

The Forest Plan (USDA Forest Service, 1997), in Appendix J, defines the core topics of the watershed analysis, and guides the scale and intensity of the analysis. The scale, intensity, and complexity of watershed analysis are to be commensurate with the level of cumulative risk. More intensive, complex, and field-based watershed analyses are conducted in watersheds with:

- high value fish habitat,
- high sediment yield risks or erosion potential,
- extensive very high and high hazard soils,
- presence of threatened, endangered or sensitive species,
- more than 20 percent of the watershed acres with trees in second growth younger than 30 years, or
- high density of roads and stream crossings.

The intensity of the analysis of the different watersheds on Kuiu Island is organized according to the guidelines of the Forest Plan. Areas with a higher risk of future impacts or greater levels of cumulative harvest receive a more detailed analysis, whereas the analysis of watersheds in non-development land use designations is less detailed. All major watersheds on Kuiu Island were identified and described according to general watershed characteristics. In addition, all major watersheds were evaluated using a Sediment Risk Analysis tool. The Sediment Risk Analysis is a GIS-based comparison of watersheds that accounts for the morphological characteristics of watersheds and their stream networks. Finally, some watersheds were evaluated based on a comparison of physical stream characteristics to the Tongass objectives for fish habitat. These are watersheds in which cumulative harvest levels exceed 20 percent, and in which timber harvest may occur in a proposed timber sale—the Kuiu Timber Sale.

Sediment Risk Assessment

The sediment risk assessment is a tool that integrates stream, soil, and watershed characteristics to facilitate an evaluation of the relative potential for sediment-related changes in stream channels to occur within a group of watersheds. Because the assessment tool is designed to compare the relative sediment risk among groups of watersheds, it is most appropriately used at the landscape level where there are many watersheds with varying morphology. The details of the Sediment Risk Assessment and the interpretation of the results are described in the All Kuiu Watersheds subsection of this appendix.

Tongass Fish Habitat objectives

The Forest Plan calls for using baseline fish habitat objectives, as described in the Anadromous Fish Habitat Assessment (USDA Forest Service, 1995) and below, for evaluating the condition of aquatic habitat in stream channels. The Tongass maintains an inventory of stream channel measurements obtained in streams draining unharvested basins. This inventory allows percentile ranges to be defined for a set of physical habitat characteristics that are considered important to fish populations. This provides criteria for evaluating the physical habitat characteristics of streams draining harvested basins. The criteria used for assessing the condition of physical habitat characteristics in this analysis include:

- pools per kilometer,
- percent of stream channel area in pools,
- pieces of large wood per kilometer of stream channel, and
- stream width-to-depth ratio.

1.7 Analysis Area

Location

Kuiu Island, part of the Alexander Archipelago, is located between Kupreanof and Baranof Islands. The nearest town is Kake, which lies on Kupreanof Island to the northeast of the analysis area.

Climate and hydrology

Climate in the analysis area is strongly influenced by a nearly constant procession of storms originating from a semi-permanent low pressure system called the Aleutian Low (USDA Forest Service, 2001b). Maritime air masses originate over the warm waters of the Pacific Ocean where heat and moisture are transferred to the atmosphere. The northward movement of warm ocean currents and air masses transports warm moist air into the coastal mountain ranges of the Alexander Archipelago. The movement of moist air masses over topographic boundaries results in heavy precipitation and strong winds. Precipitation within the analysis area ranges from about 60 inches to 200 inches annually. Stream discharge within Southeast Alaska is predominantly controlled by rainfall events, with peak discharges occurring during fall and winter storms (Jones and Fahl, 1994). Snowmelt augments stream runoff in the winter, spring and early summer, especially in watersheds with terrain above 1,500 feet elevation where a seasonal snowpack develops.

Land Use Designations

Watersheds on Kuiu were grouped by land use designation (LUD) to facilitate analyzing groups of watersheds that have similar likelihood of management impacts. This analysis includes a general characterization of watersheds that lie in LUDs that do not allow forest management, whereas watersheds that lie in LUDs that allow forest management were analyzed in greater detail.

1.8 Watersheds

All Kuiu Watersheds

This analysis considers 163 major watersheds on Kuiu Island (Figure C - 1). Watersheds were numbered between 1 and 163 so that each would have a unique identifier that could be displayed on a map. The watershed boundaries correspond to the 6th level Hydrologic Unit Code (HUC). Most of the watersheds identified are true watersheds, meaning that the watershed is well-defined by topographic boundaries and all surface water within the watershed drains to a single stream or river. Some of the numbered watersheds are actually groups of very small or poorly-defined watersheds with limited stream networks that drain the hill slopes along the shore of Kuiu Island. The grouping of these small watersheds facilitates their characterization and comparison to larger watersheds on Kuiu Island.

Kuiu Timber Sale

Figure C-1
Watersheds and Streams

Legend

- Non-National Forest
- Stream Value Class I
- Stream Value Class II
- Stream Value Class III
- Stream Value Class IV
- Project Area Boundary
- Existing Roads
- Watershed Boundary

Saginaw Bay
Keku Strait
Security Bay
Dean Creek Watershed
Saginaw Creek Watershed
Watershed 109-45-10090
Watershed 109-44-10370
Kadake Bay
Kadake Creek Watershed
Security Creek Watershed
Rowan Creek Watershed

N

0 0.5 1 2 3 4 Miles

Harvest History

Kuiu Island has a documented harvest history dating to 1911. Early harvest focused on productive areas easily accessible from saltwater, but harvest rates were low until the late 1960s when the Kuiu road system was built. Later harvest focused on productive valley bottoms and toe slopes easily accessible from the road system. More recently harvest has occurred higher on slopes and ridgetops. Harvest totaling 27,856 acres has occurred in 78 major watersheds on Kuiu Island. Cumulative harvest levels in individual watersheds vary up to a maximum of 59 percent of the total watershed area, after accounting for all harvest units and road clearings.

Sediment Risk Assessment details and results

The Sediment Risk Assessment produces a Sediment Risk Index for each watershed by integrating two indexes: 1) a sediment input potential index that accounts for potential sediment sources in a watershed and the drainage efficiency of the stream network, and 2) a sediment storage potential index that accounts for the density of low-gradient streams in a watershed that would be sensitive to increased sediment loading. The sediment risk index (SRI) is the geometric mean of the sediment input potential index and the sediment storage potential index. The interpretation of the SRI is based on the assumption that watersheds with the higher *combinations* of input potential and storage potential have higher levels of management concern because material transported from steep, unstable areas can remain in low-gradient valley-bottom streams, resulting in pool filling and other undesirable channel adjustments. Comparison of relative SRI values is facilitated by scaling each value as a proportion of the highest value, yielding an SRI value between 0 and 100 for every watershed considered.

The value of the Sediment Risk Assessment is its usefulness for comparing groups of watersheds encompassing large geographic areas where intensive field data cannot be practically obtained: it is neither a physical model nor a statistical model. As such it does not model physical processes or empirical relationships occurring in nature. However, the assessment tool is based on assumptions about natural processes that are supported by field studies. The assumptions implicit in the assessment, and the mechanics of the SRI calculation are described in Appendix A.

The Sediment Risk Assessment was completed for all 163 major watersheds on Kuiu Island. The output from the assessment is a Sediment Risk Index for each watershed. To summarize the results of the assessment, watersheds were grouped into categories based on their SRI. Categories for very low, low, moderate, high and very high risk corresponds to the 25th, 50th, 75th, and 90th percentile rankings (Table C - 2). It is important to remember that the SRI ranking is a

relative comparison of sediment risk rather than an absolute ranking. That is, the reported risk level is only relevant when compared to other watersheds on Kuiu Island.

Table C - 2 Interpretation of the Sediment Risk Index (SRI)

SRI Percentile	SRI Ranking
Greater than 90th	Very High
Between 75th and 90th	High
Between 50th and 75th	Moderate
Between 25th and 50th	Low
Less than 25th	Very low

The Sediment Risk Assessment was run twice. The first run did not account for timber harvest and road building. This provides an assessment of the inherent risk of sediment effects to streams based solely on the natural characteristics of the watershed and the stream network (Figure C-2). The second run of the SRA accounted for all roads, and timber harvest occurring within the past 30 years (Figure C-3). Timber harvest occurring more than 30 years ago was not accounted for, because harvested slopes are expected to recover rooting strength in the soil and stabilize after a 30 year period (Brardinoni *et al.*, 2002). The information summarized in Figure C-3 was used to assess the current risk of sediment effects to streams. Future risk of sediment-related change in stream channels will depend on the inherent risk, the rate at which new harvest and road building occurs, and the rate at which harvested slopes and roads re-vegetate.

When compared to the SRI values calculated for each watershed, the density of landslides that have occurred in watersheds on Kuiu Island is a useful indicator for the validity of the Sediment Risk Assessment. The SRI is used to assess the risk of sediment related impacts to streams—not just the risk of landslides—however, the occurrence of landslides is considered the major source for sediment related impacts to streams, so landslide density is an important factor to consider. The landslide density for a watershed is not used in calculating the SRI, so it provides a cross check of the SRI that is based on real observations. There is a positive trend describing the relationship between SRI and landslide density in watersheds on Kuiu Island (Chart C-1). This supports using the Sediment Risk Assessment for assessing the risk of sediment-related changes to stream channels in watersheds on Kuiu Island.

c:/workspace/kuiu_roaded/plots/arcmap/c2_inh_sed_risk.mxd 1-5-06 EP

Figure C-2
Kuiu Island
Inherent Sediment Risk

Kupreanof Island
Prince of Wales Island
Kosciusko Island
Rocky Pass
Port Camden
Kadake Bay
Threemile Arm
No Name Bay
Alvin Bay
Reid Bay
Port Beauclerc
Sumner Strait
Alecks Lake
Affleck Canal
Kell Bay
Port McArthur
Tebenkof Bay
Port Malmesbury
Saginaw Bay
Security Bay
Washington Bay
Rowan Bay
Bay of Pillars
Chatham Strait
Tradelrock

N

Legend
- Very High
- High
- Moderate
- Low
- Very Low

0 1.25 2.5 5 7.5 10 Miles

c:/workspace/kuiu_roaded/plots/arcmap/c3_fs_curr_sed_risk.mxd 1-5-06 EP

Figure C-3
Kuiu Island
Current Sediment Risk

Kupreanof Island

Prince of Wales Island

Kosciusko Island

Kake

Rocky Pass

Threemile Arm

No Name Bay

Alvin Bay

Reid Bay

Sumner Strait

Port Camden

Kadake Bay

Port Beauclerc

Alecks Lake

Affleck Canal

Kell Bay

Port McArthur

Tebenkof Bay

Port Malmesbury

Saginaw Bay

Security Bay

Washington Bay

Rowan Bay

Bay of Pillars

Chatham Strait

Tradelrick Sound

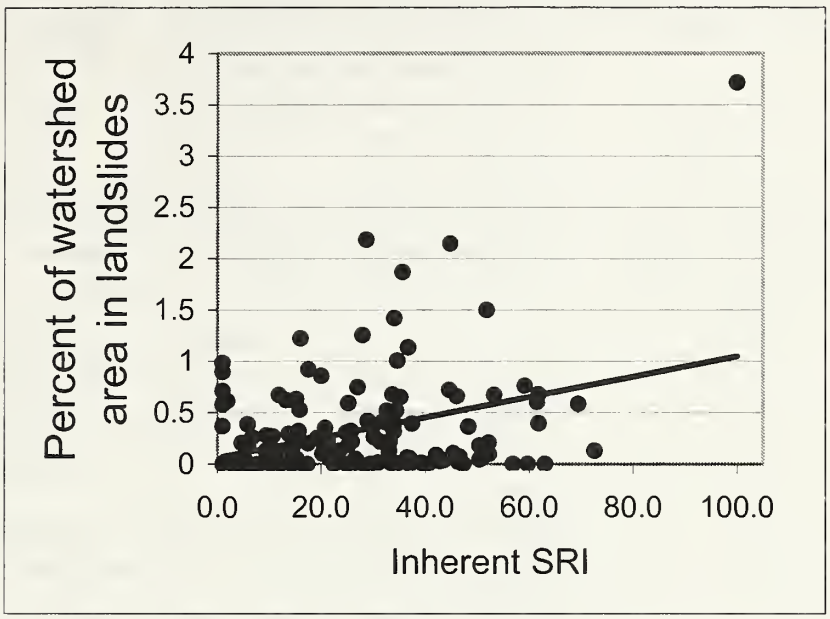
N

Legend

- Very High
- High
- Moderate
- Low
- Very Low

0 1.25 2.5 5 7.5 10 Miles

Chart C-1 Relationship between the Inherent SRI for Kuiu watersheds and the percent of watershed area in landslides



Water quality on Kuiu Island

Little has been done to assess water quality on Kuiu Island. Water quality parameters are not routinely monitored on Kuiu Island. The primary water quality parameters that can be affected by timber harvest activities are suspended sediment loads, turbidity, and stream temperature. Fuel storage on Kuiu Island also presents a potential water quality concern. All of these water quality concerns are addressed through the application of Best Management Practices (BMPs). A Memorandum of Agreement between Alaska Department of Environmental Conservation and USDA Forest Service documents the Forest Service's role in the Alaska Nonpoint Source Pollution Control Strategy. State Approved BMPs are the mechanism through which the Forest Service protects water quality from nonpoint source pollution. The Forest Service's implementation and monitoring of BMPs satisfies the requirements of the Alaska Nonpoint Source Pollution Control Strategy, and is approved by the US EPA, thereby ensuring that Forest Service activities are consistent with the Clean Water Act.

Impaired Waters

In 1996 Saginaw C ·ek was placed on the Section 303(d) list of impaired waters due to bark accumulation from the log transfer facility (LTF). However, dive survey reports from May 2002 showed that the water body was compliant with the water quality standard for residues, so Saginaw Bay was removed from the Section 303(d) list of impaired waters in 2003 (http://www.state.ak.us/dec/water/wqsar/pdfs/finali%20integrated%202002-2003%20report.pdf ; site visited on 3/3/05).

In 1996 Rowan Bay was placed on the Section 303(d) list of impaired waters due to bark accumulation from the log transfer facility (LTF). However, dive survey reports from June 2001 and May 2002 showed that the water body was compliant with the water quality standard for residues so Rowan Bay was removed from the Section 303(d) list of impaired waters in 2003 (http://www.state.ak.us/dec/water/wqsar/pdfs/finali%20integrated%202002-2003%20report.pdf ; site visited on 3/3/05).

Protected beneficial uses and water rights

The State of Alaska Water Quality Standards (18 AAC 70) set water quality standards according to protected water use classes and subclasses. Protected water use classes for freshwater include 1) water supply, 2) water recreation, and 3) growth and propagation of fish, shellfish, other aquatic life, and wildlife. The fresh waters of Kuiu Island are used primarily for water recreation, and growth and propagation of fish, shellfish, other aquatic life, and wildlife. There is also some use of water for water supply at Forest Service camps.

Watersheds in non-development LUDs

This analysis identified 73 major watersheds that lie completely in non-development land use designations (LUDs). LUDs in these watersheds include Old-growth Habitat (OG), Remote Recreation (RM), Special Interest Area (SA), Semi-remote Recreation (SM), Wild River (WR), and Wilderness (WW). SRI ranking for these watersheds ranges from very low to very high (Table C-3). Watersheds in non-development LUDs are influenced by natural processes, including flooding, landslides, and windthrow, however timber harvest and road building do not occur under the direction of the current Forest Plan. Timber harvest, mostly beach logging, occurred in 24 watersheds lying in non-development LUDs before the current land use designation was determined.

Watersheds in development LUDs

This analysis identified 90 watersh that lie partially or completely within LUDs in which timber harv nd road building are currently allowed: timber harvest has occur 54 of these. SRI ranking for watersheds in development LUDs ges from very low to very high. Twenty-three of these watersheds were ranked as high or very high for inherent risk of sediment-related changes to stream channels, based on

the sediment risk analysis described above (Figure C - 2). It is important to remember that these rankings are meant to provide a means of comparison between watersheds on Kuiu Island, rather than an absolute assessment of sediment risk.

Table C - 3: Sediment Risk Index ratings for watersheds on Kuiu Island, by LUD type

Sediment Risk Index ranking	Number of watersheds lying completely within non-development LUDs	Number of watersheds lying completely or partially in development LUDs
Very High	6	11
High	12	12
Moderate	18	22
Low	18	22
Very Low	19	23

Watersheds with greater than 20 percent cumulative harvest

This analysis identified eight watersheds in which cumulative timber harvest acreage, including road clearings, exceeds 20 percent (Table C-4). These are the most extensively harvested watersheds on the island. This group of watersheds also includes those with the highest cumulative road densities (including open and closed roads). SRI rankings in these watersheds range from very low to high both before and after accounting for recent harvest (Table C - 5).

Table C - 4 Watersheds in which cumulative harvest levels (including road clearings) exceed 20 percent

Kuiu Watershed number (Figure C-1)	Watershed name	ADF&G number	Cumulative harvest level (% of WS area)	Cumulative road density (mi/sq. mi)
10	None	109-45-10090	59%	3.5
78	None	None	40%	0
9	Straight Creek	109-44-10350	33%	2.5
3	Dean Creek	109-50-10070	33%	2.2
31	Browns Creek	109-52-10080	30%	2.2
8	Saginaw Creek	109-44-10390	29%	1.6
21	Security Creek	109-45-10100	26%	1.7
4	None	109-50-10050	21%	1.4
17	None	None	20%	2.1
142	Kadake Creek	109-42-10300	20%	1.6

Table C - 5 Sediment Risk Index ranking in watersheds with greater than 20 percent cumulative harvest levels[a]

Kuiu Watershed number (Map 4)	Inherent SRI ranking (Figure C-2)	SRI ranking (after recent harvest) (Figure C-3)
3	Low	Moderate
4	Low	Moderate
8	Moderate	High
9	High	Very High
10	Very low	Moderate
17	Low	Moderate
21	Moderate	High
31	Moderate	High
78	Very low	Very low
142	High	Very High

[a] Inherent SRI ranking was determined by performing the Sediment Risk Assessment without accounting for timber harvest or road building.

1.9 Watersheds Analyzed in Detail

Selection of watersheds for detailed analysis

Watersheds discussed in the following sections were analyzed in greater detail. The Forest Plan guides the intensity of watershed analysis, and states that the scale, intensity, and complexity of watershed analysis are to be commensurate with the level of cumulative risk. Planning for future timber sales on Kuiu Island is ongoing. The Kuiu Timber Sale, which is currently in the planning stage, may propose additional timber harvest in watersheds on the northern portion of Kuiu Island, including the Dean Creek, Saginaw Creek, Security Creek, and Kadake Creek watersheds, and the watershed drained by ADF&G stream # 109-45-10090. Each of these watersheds has cumulative harvest levels of 20 percent or greater (Table C-4), and each is analyzed separately in the following sections. Dean Creek, Security Creek, and Kadake Creek have been the focus of watershed analyses dated 1997, 1997, and 1994, respectively. The current analysis is similar in content but reflects current conditions.

Methods

Data collection

Field data to support the following analyses came from three different sources. Stream reaches in Saginaw Creek, Security Creek, and ADF&G stream #109-45-10090 were randomly selected and surveyed

in the summer of 2004 according to Tier 3 Methods described in the Aquatic Habitat Management Handbook (USDA Forest Service, 2001a). Tier 3 stream channel data for Dean Creek were gathered in the spring of 2003 as part of the Tongass-wide stream channel buffer effectiveness monitoring program. Data for Kadake Creek were excerpted from an unpublished report prepared in 1994 by the Forestry Sciences Laboratory in Juneau.

Tongass Fish Habitat objectives

The Forest Plan calls for using baseline fish habitat objectives, as described in the Anadromous Fish Habitat Assessment (USDA Forest Service, 1995) and below, for evaluating the condition of aquatic habitat in stream channels. The Tongass maintains an inventory of stream channel measurements obtained in streams draining unharvested basins. This inventory allows percentile ranges to be defined for a set of physical habitat characteristics that are considered important to fish populations (Table C - 6). This provides criteria for evaluating the physical habitat characteristics of streams draining harvested basins. For this report, stream channel condition is rated as poor, fair, good, or excellent, depending on where the stream lies in comparison to the Tongass fish habitat objectives (Table C - 7).

Table C - 6 Tongass fish habitat objectives for Flood Plain channel types

	Channel type	Percentile		
		25th	50th	75th
Number of pools per kilometer	All FP	25	41	53
Percent pool area	All FP	27%	49%	61%
Pieces of wood per 1000 m2	FP4	8	24	34
	FP5	4	5	6
Width-to-depth ratio	FP4	16	25	35
	FP5	30	45	70

FP4 and FP5 are similar, except that FP5 channels are larger. Percentiles are used as a baseline for comparisons.

Table C - 7 Interpretation of percentile ranking for stream channel characteristics

Parameter	Percentile ranking and interpretation			
	25th	50th		75th
Pools per reach, percent pool area, LWD per 1000m^2	Poor	Fair	Good	Excellent
W:D ratio	Excellent	Good	Fair	Poor

Saginaw Creek Watershed

General

Saginaw Creek (ADF&G # 109-44-10390, Kuiu Watershed # 8) drains an 8,302-acre watershed. Two major forks, the East Fork and the West Fork, converge and flow into Saginaw Bay. Annual precipitation ranges from near 90 inches at the mouth of Saginaw Creek to around 120 inches in the headwaters of the watershed (USDA Forest Service, 1979). The Saginaw watershed lies in the Rowan Sediments Ecological Subsection (USDA Forest Service, 2001b).

Stream channels

Though the majority of stream channels in the Saginaw Watershed are in the High-gradient-Contained process group, mile per mile, there is a relatively large proportion of streams in the Moderate-gradient Mixed-control and Flood Plain process groups, when compared to other Kuiu watersheds (Chart C-2). The Saginaw Creek Watershed lies between the 75th and 90th percentile for the density—calculated as length of stream per unit of watershed area—of these types of streams. This means that there is a high proportion of stream channels that are of high value for anadromous and resident fish habitat (Chart C-3). Because these streams have moderate to low gradient they may be susceptible to sediment-related changes in channel morphology, such as pool filling and widening. The Saginaw Creek Watershed lies above the 90th percentile for drainage density—total stream length per unit of watershed area—amongst Kuiu watersheds, which indicates that the watershed is highly efficient at routing water and sediment from headwater areas to low gradient streams in valley bottoms.

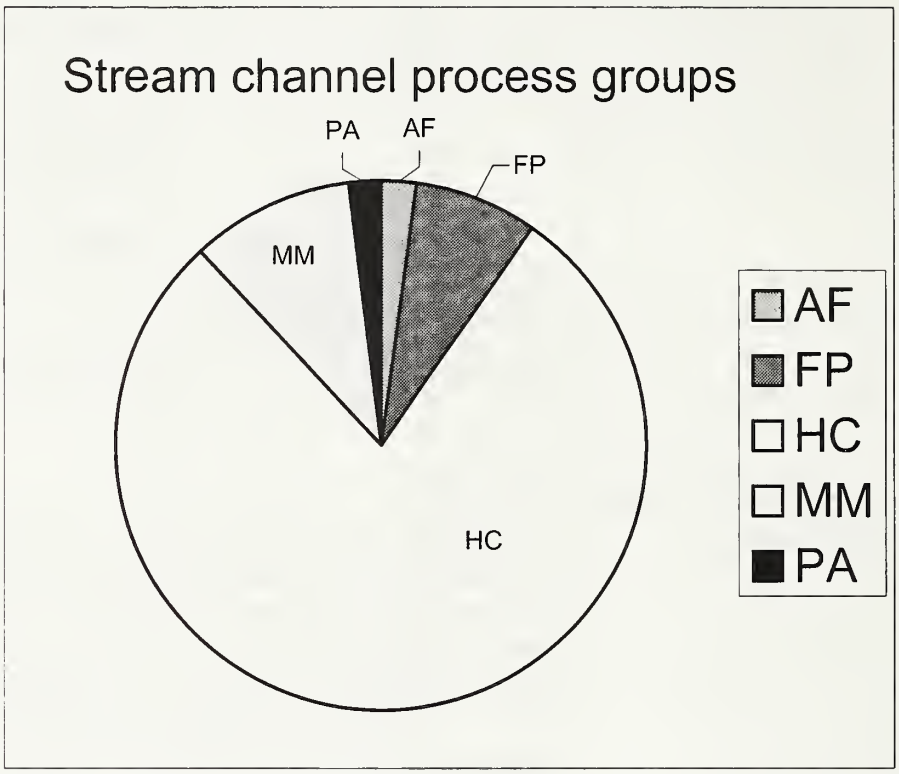


Chart C-2: Saginaw Creek Watershed stream channel process groups
AF = Alluvial Fan; FP =Flood Plain; HC = High-gradient Contained;
MM = Moderate-gradient Mixed-control; PA = Palustrine.

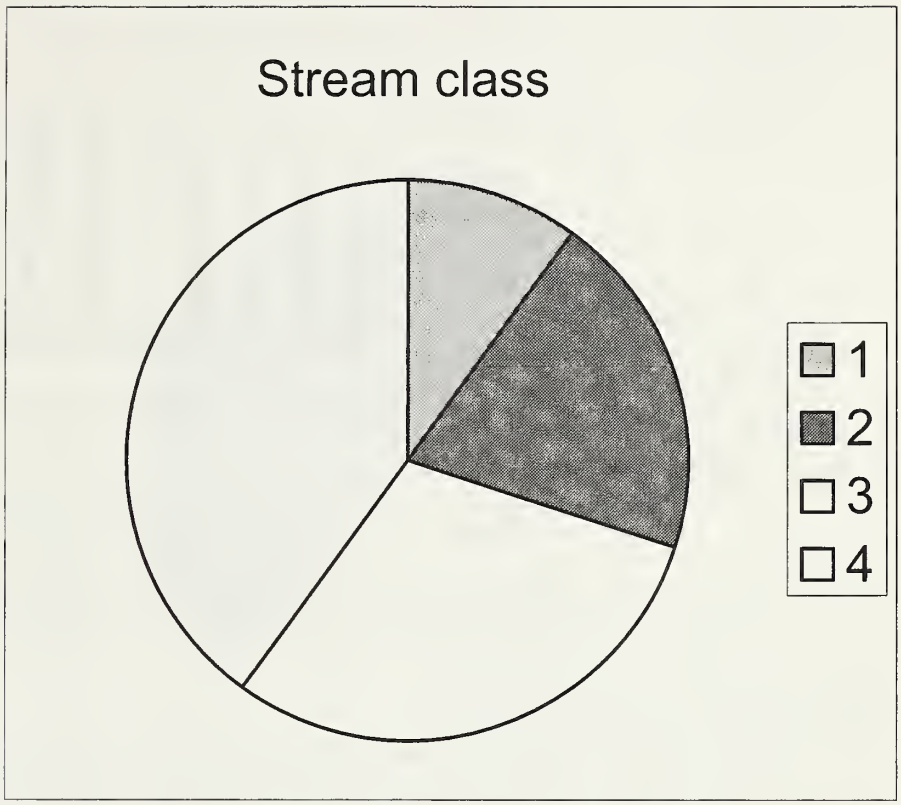


Chart C-3: Saginaw Creek Watershed stream classes:
1 = stream habitat that supports anadromous fish populations; 2 = stream habitat that supports resident fish populations; 3 = streams that do not support fish populations, but that deliver sufficient sediment and water to directly affect downstream fish habitat; 4 = streams that do not support fish or transport enough water and sediment to directly affect downstream fish habitat.

Harvest history

The Saginaw Watershed has a harvest history dating to 1968 (Chart C-4). Twenty nine percent (2440 acres) of this watershed has been harvested (after accounting for road clearings), but only eight percent of the watershed has been harvested within the last 30 years. Early harvest was concentrated in valley bottoms and toe slopes, whereas more recent harvest has occurred on mid-slopes and ridge tops. Harvest in riparian areas totaled 450 acres, or five percent of the watershed area. Comparison of the 1977 and 1997 aerial photography indicates that many harvested areas have regenerated with alder, or a matrix of alder and conifers, and that alder currently comprises a much larger component of the canopy cover than it did in 1977. Alder are visible in disturbed areas along stream channels, temporary roads, and within harvest units.

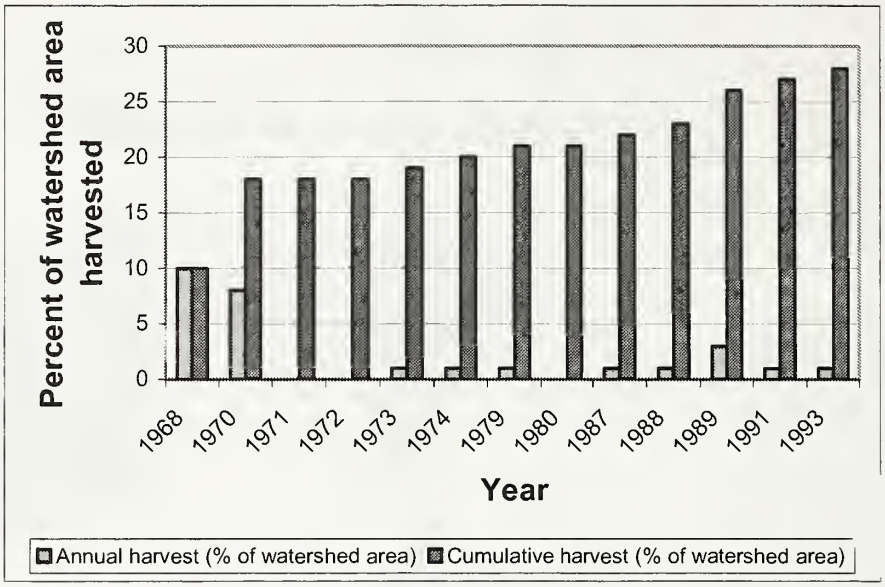


Chart C - 4: Harvest history in the Saginaw Creek Watershed. This figure does not account for timber harvested for road clearings.

Roads

There are a total of 20.4 miles of cataloged roads in the Saginaw Watershed (Table C - 8). Road building in the Saginaw Watershed dates back to the 1960s. Maintenance needs are increasing as the road system and drainage structures age.

Table C - 8: Miles of Road in the Saginaw Creek Watershed

Road classification	Miles
Classified	10.6
Temporary	9.8
Total	20.4

Landslide inventory

The landslide inventory identified 19 landslides in the Saginaw Watershed (Figure C - 4) totaling 118 acres or approximately 1.4 percent of the watershed. This puts the Saginaw Watershed above the 90th percentile for landslide density compared to other Kuiu watersheds. The majority of slides in the Saginaw Watershed occurred in 1988. Aerial photographs and field reconnaissance indicate that some of the landslides either initiated within stream channels or deposited material in stream channels. The Saginaw Creek watershed is between the 25th and 50th percentile for the proportion of the watershed lying on slopes in the high or very high Mass Movement Hazard (MMH) category.

Sediment risk assessment

The sediment risk assessment for Kuiu Island identified the Saginaw Creek Watershed as having a moderate inherent risk for sediment related changes in stream channel characteristics, compared to other Kuiu watersheds (Figure C - 2). The risk rating increased to high after accounting for harvest and road-building (Figure C - 3). This increase indicates: 1) that the inherent characteristics of the stream channel network may make it susceptible to changes in stream channel condition if sediment supply is increased, and 2) that timber harvest and road building have increased the area of potential sediment sources within the watershed. This does not mean that sediment-related changes to stream channels are expected, only that their likelihood has increased. The high occurrence of landslides in the Saginaw Creek watershed suggests that the high sediment risk rating is appropriate.

Stream channel condition

Stream channel characteristics were measured in randomly selected FP3 stream reaches in the East and West Forks of Saginaw Creek. The East Fork of Saginaw Creek was in fair condition both for the number of pools and the percentage of channel area in pools; in good condition concerning the width-to-depth ratio; and in excellent condition for wood loading (Table C-7). The West Fork of Saginaw Creek was in good condition for number of pools; in fair condition for pool area; in excellent condition for wood loading, and in good condition considering the width-to-depth ratio (Table C-9). Because the available stream channel condition data represent only a snapshot in time, it cannot be determined whether the below-average pool area in the East and West Forks of Saginaw Creek, and below-average pools per kilometer in East Fork Saginaw represent a decrease in pools over time, or simply natural variability in stream channel conditions.

Table C - 9 Stream channel condition: East Fork Saginaw Creek

Channel characteristic	Value	Percentile ranking	Condition
Number of pools / kilometer	37.1	Between 25th and 50th	Fair
% channel area in pools	37.9	Between 25th and 50th	Fair
Pieces of wood per 1000 m^2	56.3	Greater than 75th	Excellent
Width-to-depth ratio	20.0	Between 25th and 50th	Good

Table C – 10 Stream channel condition: West Fork Saginaw Creek

Channel characteristic	Value	Percentile ranking	Condition
Number of pools / kilometer	48.9	Between 50th and 75th	Good
% channel area in pools	31.8	Between 25th and 50th	Fair
Pieces of wood per 1000 m^2	54.7	Greater than 75th	Excellent
Width-to-depth ratio	20.0	Between 25th and 50th	Good

Management Implications

The Saginaw Creek watershed lies almost entirely within the Timber Management LUD. In addition to providing timber, the Saginaw Creek watershed is also an important producer of coho salmon (*O. kisutch*) and pink salmon (*O. gorbuscha*), both of which support commercial fisheries in Southeast Alaska.

The high current sediment risk rating, and the high occurrence of landslides suggests that appropriate management in the Saginaw Creek Watershed would include strict avoidance of potentially unstable slopes when planning road locations and timber harvest units, diligent maintenance of open roads, and placing roads in storage when not needed for specific planned activities. With cumulative harvest levels approaching 30 percent of the area in the Saginaw Creek watershed it can be expected that harvesting additional acreage within the watershed will require accessing steeper, more difficult terrain, thereby assuming a greater risk of landslides. This further underscores the need for careful planning and maintenance. It is not possible to say whether below-average pool area in East and West forks of Saginaw Creek, and below-average pools per kilometer in East Fork Saginaw are due to management activities, or simply a natural characteristic of these streams. Still, these stream channel characteristics indicate that careful management of sediment sources is important.

Watershed Improvement opportunities

Within the Saginaw Creek watershed, 1.6 miles of Road 6418, 2.7 miles of Road 6413, and 1.9 miles of Road 46096 are recommended to be placed in storage when no longer needed for planned timber harvest activities. Placing roads in storage involves removing all culverts, excavating additional waterbars in the road surface, and allowing natural revegetation on the road and in the road ditch. This restores more natural drainage patterns and eliminates the risk of road failures at stream crossings, culvert plugging, and stream diversion. Natural revegetation further reduces the risk of sediment delivery to streams.

The high occurrence of wood in both forks of Saginaw Creek reflect the high productivity of riparian stands in this watershed. Though the stream channels are not lacking wood, the high percentage of riparian stands that have been harvested and the high productivity of the riparian stands, suggest that opportunities exist for thinning of riparian stands, and that these stands would respond well to thinning. Thinning treatments would be an appropriate way to promote the development of large conifers that would eventually be recruited into the stream channel. Thinning of riparian stands would also have other benefits, particularly for wildlife. There are 450 acres of harvested riparian areas in the Saginaw Creek watershed that need to be evaluated for thinning opportunities.

Security Creek Watershed

General

Security Creek (ADF&G # 109-45-10100, Kuiu watershed # 21) drains a 5,931 acre watershed on North Kuiu Island. Two major forks, the East Fork and the West fork, converge and flow into Security Bay. Annual precipitation ranges from near 90 inches at the mouth of Security Creek to around 130 inches in the headwaters of the watershed (USDA Forest Service, 1979). The Security Creek Watershed lies in the Rowan Sediments ecological subsection (USDA Forest Service, 2001b).

Stream channels

Mile per mile, the Security Creek Watershed also has a relatively large proportion of streams in the Moderate-gradient Mixed-control and Flood Plain process groups (Chart C-5). The Security Creek Watershed lies between the 50th and 75th percentile for the density—calculated as length of stream per unit of watershed area—of these types of streams. This means that there is a high proportion of stream channels that are of high value for anadromous and resident fish habitat (Chart C-6). Because these streams have moderate to low gradient they may be susceptible to sediment-related changes in channel morphology, such as pool filling and widening. The Security Creek Watershed lies between the 75th and the 90th percentile for drainage density amongst Kuiu watersheds, which indicates that the

watershed is efficient at routing water and sediment from headwater areas to low gradient streams in valley bottoms.

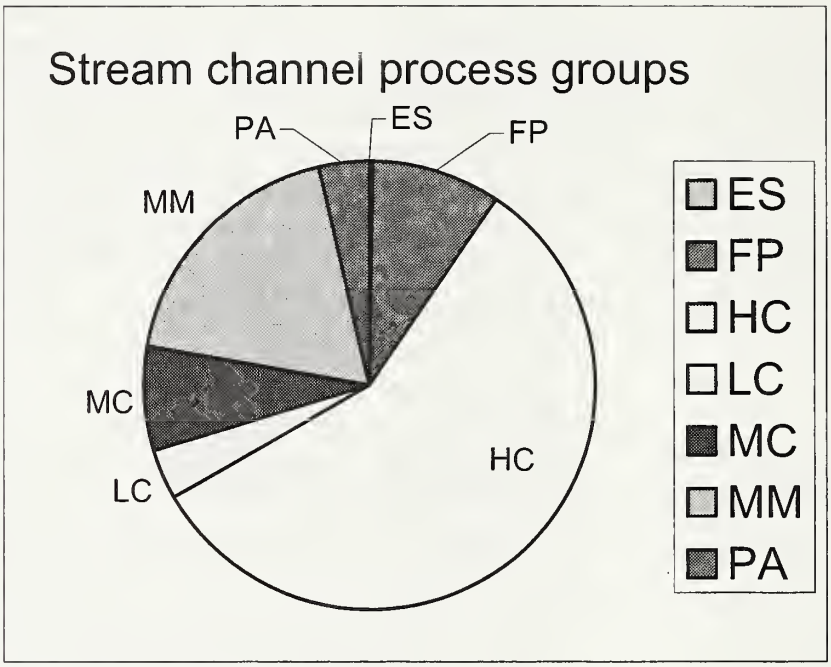


Chart C-5: Stream channel process groups in the Security Creek Watershed. ES = Estuary; FP =Flood Plain; HC = High-gradient Contained; LC = Large contained; MC = Moderate-gradient Contained; MM = Moderate-gradient Mixed-control; PA = Palustrine.

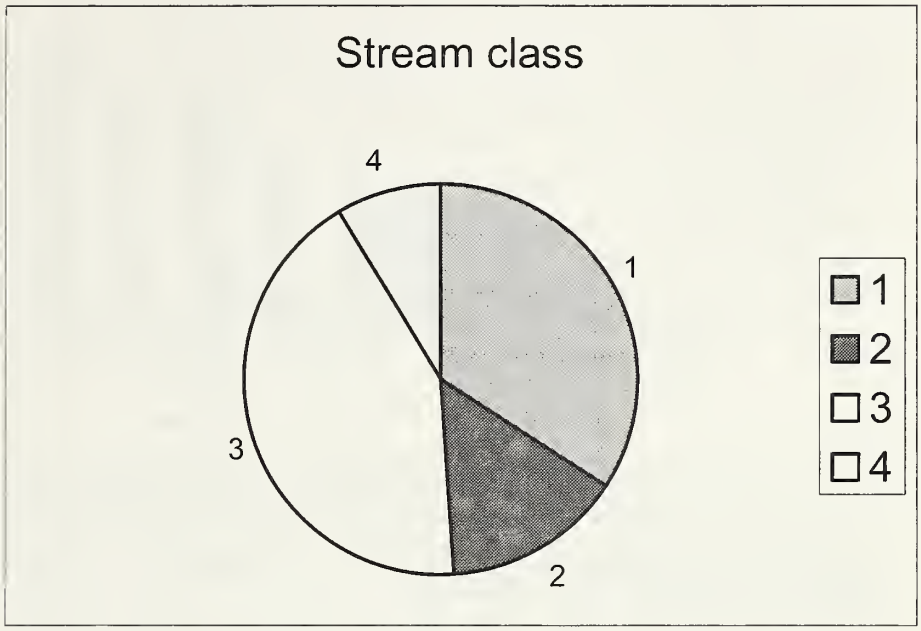


Chart C-6: Stream classes in the Security Creek Watershed: 1 = stream habitat that supports anadromous fish populations; 2 = stream habitat that supports resident fish populations; 3 = streams that do not support fish populations, but that deliver sufficient sediment and water to directly affect downstream fish habitat; 4 = streams that do not support fish or transport enough water and sediment to directly affect downstream fish habitat.

Harvest history

The Security Creek watershed has a harvest history dating to 1974 (Chart C-7). Twenty six percent (1,546 acres) of this watershed has been harvested (after accounting for road clearings). Harvest in riparian areas totaled 78 acres, or 1.3 percent of the watershed area.

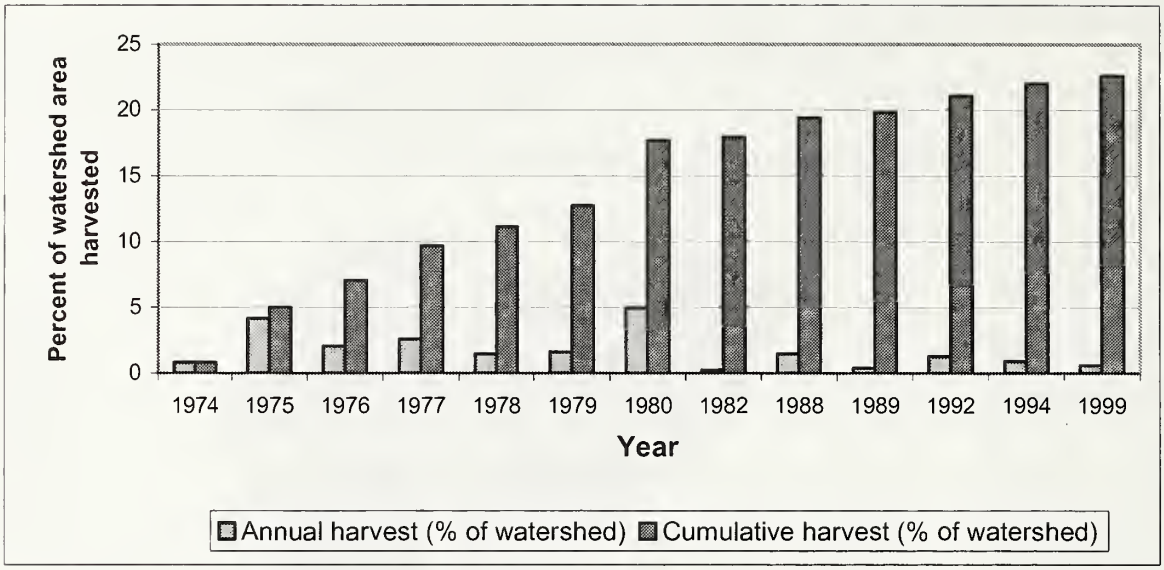


Chart C-7: Harvest history in the Security Creek Watershed. This figure does not account for timber harvested for road clearings.

Roads

There are a total of 16.1 miles of cataloged roads in the Security Creek Watershed (Table C - 11). Road building in the Security Creek Watershed dates back to the 1960s.

Table C - 11 Road miles in the Security Creek Watershed

Road classification	Miles
Classified	9.9
Temporary	6.2
Total	16.1

Landslide inventory

The landslide inventory identifies 12 landslides in the Security Creek Watershed (Figure C - 4) totaling 19 acres or approximately 0.3 percent of the watershed. This puts the Security Creek Watershed between the 50th and 75th percentile for landslide density compared to other Kuiu Watersheds. The Security Creek watershed lies between the 25th and 50th percentile for proportion of the watershed lying on slopes in the high or very high Mass Movement Hazard (MMH) categories.

Sediment risk assessment

The sediment risk assessment for Kuiu Island identified the Security Creek Watershed as having a moderate inherent risk for sediment

related changes in stream channel characteristics, compared to other Kuiu watersheds (Figure C-2). After accounting for harvest and road-building, the risk rating for sediment related changes in stream channel characteristics was high (Figure C-3). This increase indicates: 1) that the inherent characteristics of the stream channel network may make it susceptible to changes in stream channel condition if sediment supply is increased, and 2) that timber harvest and road building have increased the area of potential sediment sources within the watershed. This does not mean that sediment-related changes to stream channels are expected, only that their likelihood has increased. The above-average occurrence of landslides in the Security Creek watershed suggests that the high sediment risk rating is appropriate.

Stream channel condition

Stream channel characteristics were measured in a randomly selected FP5 stream reach in Security Creek. Security Creek was in poor condition for the number of pools; in fair condition for the percentage of channel area in pools; and in excellent condition concerning the width-to-depth ratio (Table C-12). Data for wood loading in Security Creek are not available. Because the available stream channel condition data represent only a snapshot in time, it cannot be determined whether the number of pools and below-average pool area in Security Creek represent a decrease in channel condition over time, or simply natural variability in stream channel conditions. The excellent rating for the width-to-depth ratio suggests that sediment loading within the stream channel is not the cause of the below-average number of pools and pool area.

Table C-12 Stream channel condition: Security Creek

Channel characteristic	Value	Percentile ranking	Condition
Number of pools / kilometer	7.1	Less than 25th	Poor
% channel area in pools	39.0	Between 25th and 50th	Fair
Pieces of wood per 1000 m^2	No data	No data	No data
Width-to-depth ratio	27.5	Less than 25th	Excellent

Management Implications

The Security Creek watershed lies almost entirely within the Timber Management LUD. In addition to providing timber, the Security Creek watershed is also an important producer of coho salmon (*O. kisutch*) and pink salmon (*O. gorbuscha*), both of which support commercial fisheries in Southeast Alaska.

The high current sediment risk rating and the above-average occurrence of landslides suggests that appropriate management in the Security Creek Watershed would include avoidance of potentially unstable slopes when planning road locations and timber harvest units, diligent maintenance of open roads, and placing roads in storage when not needed for specific planned activities. With cumulative harvest levels reaching 26 percent of the area in the Security Creek watershed it can be expected that harvesting additional acreage within the watershed will require accessing steeper, more difficult terrain, thereby assuming a greater risk of landslides. This further underscores the need for careful planning and maintenance. It is not possible to say whether the below-average number of pools and percentage of stream channel in pools in Security Creek are due to management activities, or simply a natural characteristic of these streams. Still, these stream channel characteristics indicate that careful management of sediment sources is important, and that measures to protect or enhance wood recruitment into streams would be appropriate.

Watershed Improvement Opportunities

There are 78 acres of harvested riparian areas in the Security Creek watershed that need to be evaluated for thinning opportunities. Thinning treatments would promote the development of large conifers that would eventually be recruited into the stream channel. This may be an appropriate way to improve the number of pools and the percentage of channel area in pools in Security Creek in the future.

Thinning of riparian stands may also have other benefits, particularly for wildlife.

Watershed #109-45-10090

General

ADF&G stream # 109-45-10090 is an unnamed creek that drains a 2,140-acre watershed (Kuiu Watershed #10) on North Kuiu Island and flows into Security Bay. Annual precipitation in this watershed ranges from near 90 inches at the mouth of the watershed to around 120 inches in the headwaters of the watershed (USDA Forest Service, 1979). This watershed lies entirely within the Rowan Sediments Ecological Subsection (USDA Forest Service, 2001b).

Stream channels

The stream network in Watershed #109-45-10090 is more typical of medium-sized or smaller watersheds on Kuiu Island, which may have a large proportion of Moderate-gradient Mixed-control stream channels, but a smaller proportion of Flood Plain stream channels (Chart C-8). This watershed lies below the 25th percentile for the density—calculated as length of stream per unit of watershed area—of these types of streams. This means that there is a lower proportion of stream channels that are of high value for anadromous fish habitat (Chart C-9), compared to larger watersheds on Kuiu. Still, this watershed does support anadromous fish populations. Because there is only a small proportion of streams that have moderate to low gradients, any sediment related changes in channel morphology that do occur are likely to be concentrated. This watershed lies between the 75^{th} and the 90^{th} percentile for drainage density amongst Kuiu watersheds, which indicates that the watershed is efficient at routing water and sediment from headwater areas to the low gradient streams near the mouth of the watershed.

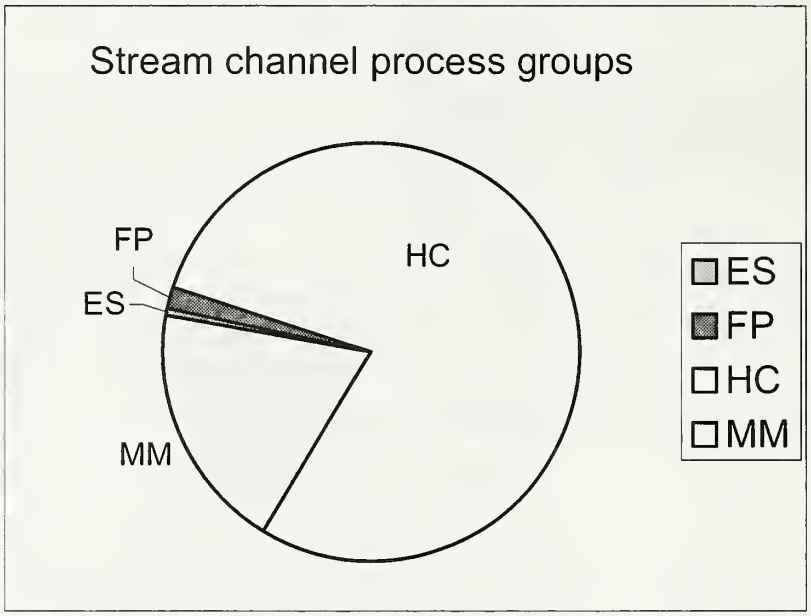


Chart C -8: Stream channel process groups in Watershed #109-45-10090. ES = Estuary; FP =Flood Plain; HC = High-gradient Contained; MM = Moderate-gradient Mixed-control.

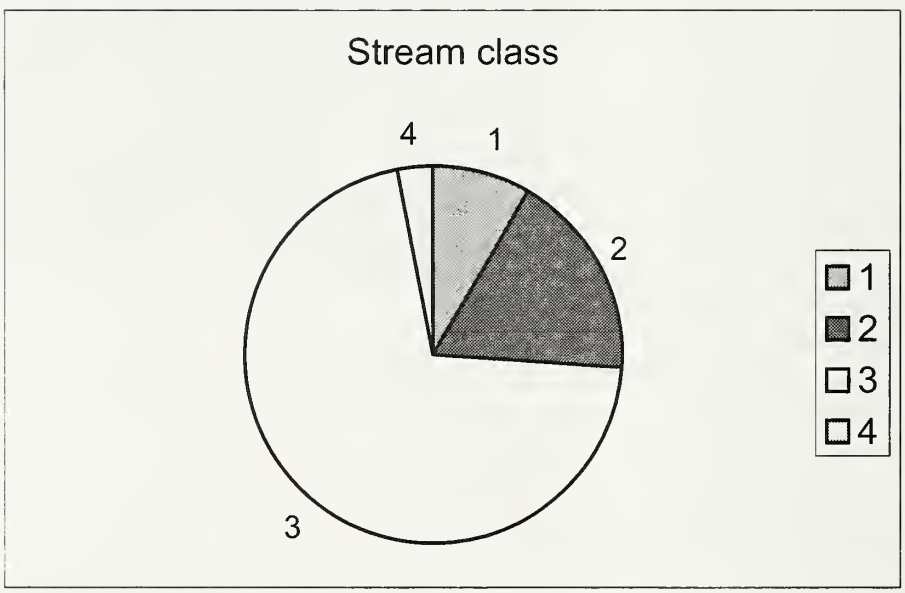


Chart C-9: Stream classes in Watershed #109-45-10090: 1 = stream habitat that supports anadromous fish populations; 2 = stream habitat that supports resident fish populations; 3 = streams that do not support fish populations, but that deliver sufficient sediment and water to directly affect downstream fish habitat; 4 = streams that do not support fish or transport enough water and sediment to directly affect downstream fish habitat.

Harvest history

Watershed #109-45-10090 has a harvest history dating to 1972 (Chart C-10). Fifty-nine percent (1,266 acres) of this watershed has been harvested (after accounting for road clearings), but only 28 percent of the watershed has been harvested within the last 30 years. Harvest in riparian areas totaled 85 acres or four percent of the watershed area.

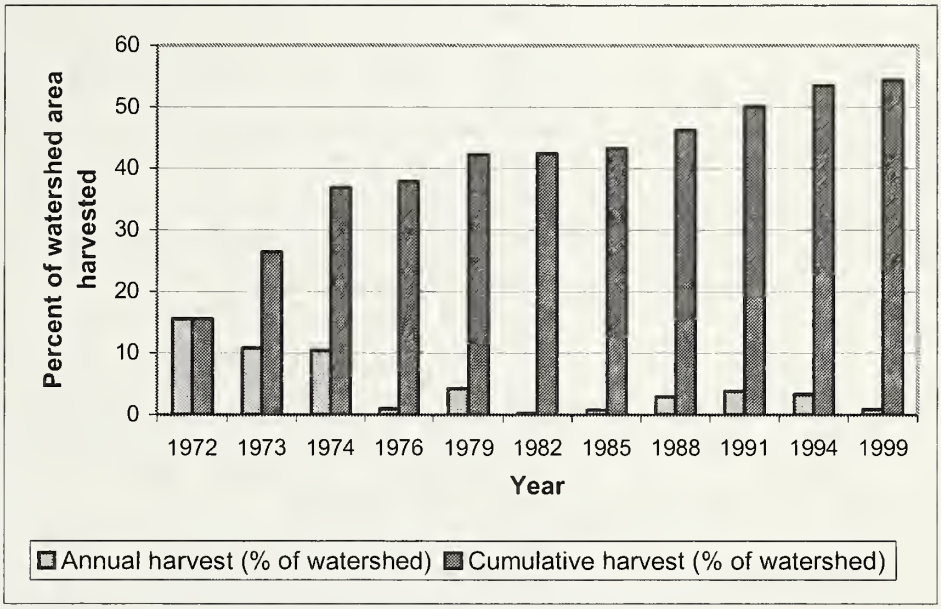


Chart C -10: Harvest history for watershed # 109-45-10090. This figure does not account for timber harvested for road clearings.

Roads

There are a total of 11.6 miles of cataloged roads in Watershed # 109-45-10090 (Table C - 13). Road building in this watershed dates back to the 1960s.

Table C - 13 Road miles in watershed #109-45-10090

Road classification	Miles
Classified	4.4
Temporary	7.2
Total	11.6

Landslide inventory

The landslide inventory identified five landslides in Watershed #109-45-10090 (Figure C-4), totaling 4.4 acres, or 0.2 percent of the watershed. This puts this watershed between the 50th and 75th percentile for landslide density compared to other watersheds on Kuiu Island. Aerial photographs and field reconnaissance indicate that some

of the landslides either initiated within stream channels or deposited material in stream channels. This watershed lies below the 25th percentile for proportion of the watershed lying on slopes in the high or very high Mass Movement Index (MMI) categories.

Sediment risk assessment

The sediment risk assessment for Kuiu Island identified Watershed #109-45-10090 as having a very low inherent risk for sediment related changes in stream channel characteristics, compared to other Kuiu watersheds (Figure C-2). After accounting for harvest and road-building, the risk rating for sediment related changes in stream channel characteristics was moderate (Figure C-3). This increase indicates: 1) that the inherent characteristics of the watershed may make it susceptible to changes in stream channel condition if sediment supply is increased, and 2) that timber harvest and road building have increased the area of potential sediment sources within the watershed. This does not mean that sediment-related changes to stream channels are expected, only that their likelihood has increased. Landslide occurrence in this watershed is greater than average for Kuiu Island (but not much greater), indicating that the moderate sediment risk rating is appropriate.

Stream channel condition

Stream channel characteristics were measured in a randomly selected FP3 stream reach in Stream #109-45-10090. This creek was in good condition for the number of pools; in fair condition for the percentage of channel area in pools; in excellent condition for wood loading, and in poor condition concerning the width-to-depth ratio (Table C - 14). The good rating for number of pools, and fair rating for percent of channel area in pools indicates that there are many pools, but that they are smaller than average for a stream of this size. This is not likely due to a lack of wood loading in the channel, because wood loading was rated as excellent. Below average pool area and the poor width-to-depth ratio may be related to high sediment loading. While these could be natural characteristics of the stream channel, they may also reflect channel adjustments resulting from landslides—visible on aerial photographs—that likely increased sediment loading in channels upstream.

Table C - 14 Stream channel condition: ADF&G stream # 109-45-10090

Channel characteristic	Value	Percentile ranking	Condition
Number of pools / kilometer	49.1	Between 50th and 75th	Good
% channel area in pools	48.1	Between 25th and 50th	Fair
Pieces of wood per 1000 m^2	89.2	Greater than 75th	Excellent
Width-to-depth ratio	35.6	Greater than 75th	Poor

Management Implications

This watershed lies entirely within the Timber Management LUD. In addition to providing timber, this watershed is also a producer of coho salmon (*O. kisutch*) and pink salmon (*O. gorbuscha*), both of which support commercial fisheries in Southeast Alaska.

The very low inherent sediment risk rating and the moderate current sediment risk rating suggest that this watershed is well-suited to timber harvest. However, the extensive harvest history, the landslide history, and the stream channel conditions indicate the possibility that sediment loading within streams in this watershed has been increased above natural levels. The below-average percentage of pools and poor width-to-depth ratio indicate the need for careful management including avoidance of potentially unstable slopes when planning road locations and timber harvest units, diligent maintenance of open roads, and placing roads in storage when not needed for specific planned activities. With cumulative harvest levels approaching 60 percent of the area in this watershed it can be expected that harvesting additional acreage within the watershed will require accessing steeper, more difficult terrain, thereby assuming a greater risk of landslides. This further underscores the need for careful planning and maintenance.

Watershed Improvement Opportunities

Within this watershed, 1.4 miles of Road 46021 are recommended to be placed in storage when no longer needed for planned timber harvest activities. Placing roads in storage involves removing all culverts, excavating additional waterbars in the road surface, and allowing natural revegetation on the road and in the road ditch. This restores more natural drainage patterns and eliminates the risk of road failures at stream crossings, culvert plugging, and stream diversion. Natural revegetation further reduces the risk of sediment delivery to streams.

Dean Creek Watershed

General

Dean Creek (ADF&G # 109-50-10070, Kuiu Watershed #3) drains a 4,690-acre watershed on North Kuiu Island and flows into Frederick Sound. Annual precipitation ranges from near 60 inches at the mouth of Dean Creek to around 110 inches in the headwaters of the watershed (USDA Forest Service, 1979). The Dean Creek watershed lies in the Rowan Sediments Ecological Subsection (USDA Forest Service, 2001b). The Forest Service constructed a fishpass on Dean Creek in 1984 to provide coho salmon passage over a 13-foot waterfall. The fishpass was modified in 1994 to allow for the migration of pink salmon.

Stream channels

The Dean Creek Watershed has an exceptionally large proportion of streams in the Moderate-gradient Mixed-control and Flood Plain process (Chart C-11). This watershed lies above the 90th percentile for the density—calculated as length of stream per unit of watershed area—of these types of streams. This means that there is a high proportion of stream channels that are of high value for anadromous and resident fish habitat (Chart C-12). Because these streams have moderate to low gradient they may be susceptible to sediment-related changes in channel morphology, such as pool filling and widening. The Dean Creek Watershed lies between the 75th and the 90th percentile for drainage density amongst Kuiu watersheds, which indicates that the watershed is efficient at routing water and sediment from headwater areas to low gradient streams in valley bottoms.

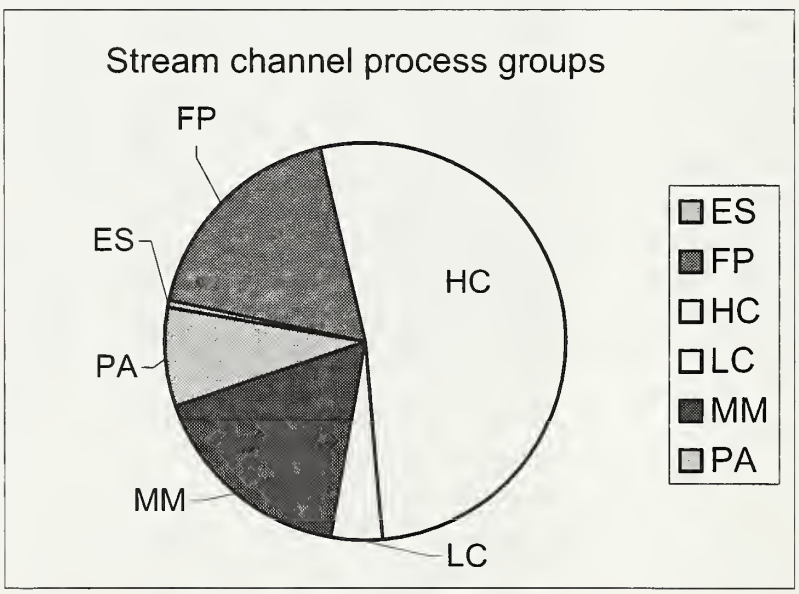


Chart C - 11: Stream channel process groups in the Dean Creek Watershed. ES = Estuary; FP =Flood Plain; HC = High-gradient Contained; LC = Large contained; MM = Moderate-gradient Mixed-control; PA = Palustrine.

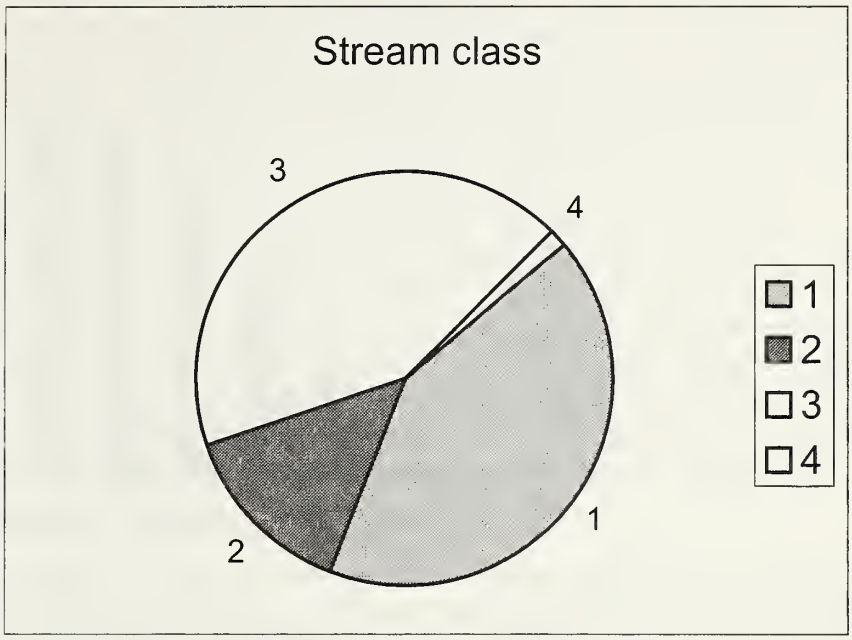


Chart C - 12: Stream classes in the Dean Creek Watershed: 1 = stream habitat that supports anadromous fish populations; 2 = stream habitat that supports resident fish populations; 3 = streams that do not support fish populations, but that deliver sufficient sediment and water to directly affect downstream fish habitat; 4 = streams that do not support fish or transport enough water and sediment to directly affect downstream fish habitat.

Harvest history

The Dean Creek Watershed has a harvest history dating to 1975 (Chart C-13). Thirty-three percent (1,538 acres) of this watershed has been harvested (after accounting for road clearings), with 30 percent of the watershed having been harvested within the last 30 years (as of 2004). Harvest of riparian areas totaled 105 acres or 2.2 percent of the watershed area.

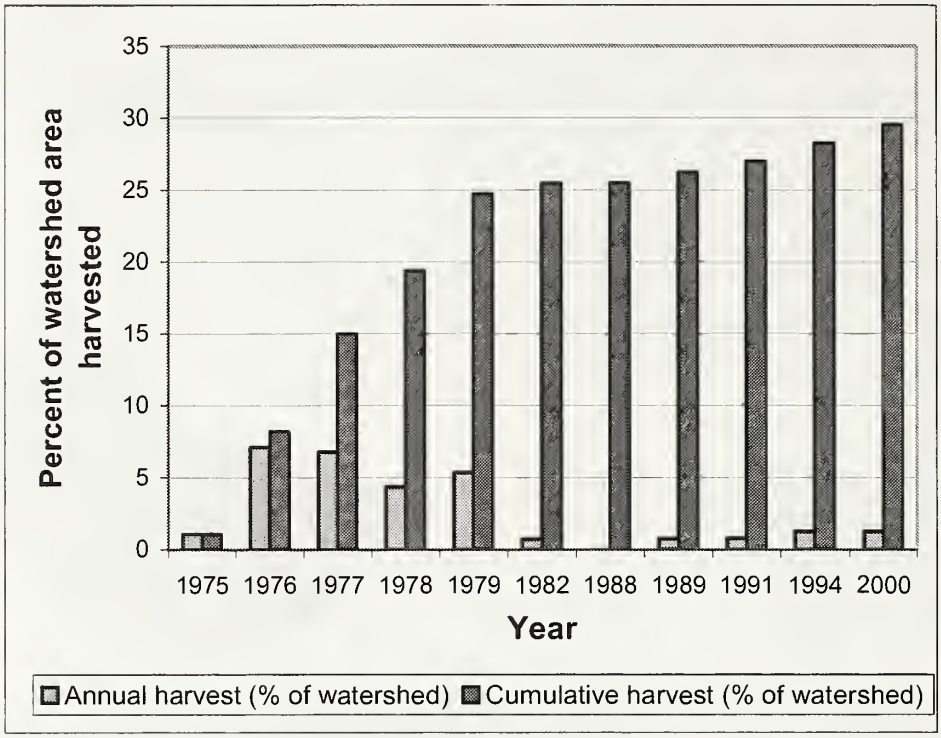


Chart C-13: Harvest history for the Dean Creek Watershed. This figure does not account for timber harvested for road clearings.

Roads

There are a total of 16.3 miles of cataloged roads in the Dean Creek Watershed (Table C - 15). Road building in the Dean Creek Watershed dates back to the 1970s.

Table C-15. Road miles in the Dean Creek Watershed

Road classification	Miles
Classified	10.1
Temporary	6.2
Total	16.3

Landslide inventory

The landslide inventory identified one landslide in the Dean Creek Watershed (Figure C-4) totaling 30 acres or approximately 0.6 percent of the watershed. This landslide occurred in 1980. Though there was only one landslide identified for this watershed, it was large enough to put the Dean Creek watershed above the 75th percentile for percent of watershed area in landslides. The watershed lies below the 25th percentile for the proportion of the watershed lying on slopes in the high or very high Mass Movement Hazard (MMH) categories.

Sediment risk assessment

The sediment risk assessment for Kuiu Island identified the Dean Creek Watershed as having a low inherent risk for sediment related changes in stream channel characteristics, compared to other Kuiu watersheds (Figure C-2). After accounting for harvest and road-building, the risk rating for sediment related changes in stream channel characteristics was moderate (Figure C-3). This increase indicates: 1) that the inherent characteristics of the watershed may make it susceptible to changes in stream channel condition if sediment supply is increased, and 2) that timber harvest and road building have increased the area of potential sediment sources within the watershed. This does not mean that sediment-related changes to stream channels are expected, only that their likelihood has increased. Although there was only one landslide identified in this watershed it was very large, indicating that the moderate sediment risk rating is appropriate.

Stream channel condition

Stream channel characteristics were measured in an FP4 stream reach in Dean Creek. Dean Creek was in excellent condition for the number of pools and in fair condition for the percentage of channel area in pools; in good condition for wood loading, and in fair condition concerning the width-to-depth ratio (Table C-16). The excellent rating for number of pools, and fair rating for percent of channel area in pools indicates that there are many pools, but that they are smaller than average for a stream of this size. Because the available stream channel condition data represent only a snapshot in time, it cannot be determined whether the below average percent area in pools and width-to-depth ratio represent a decrease in channel condition over time—possibly due to increased sediment loading—or simply natural variability in stream channel conditions.

Table C-16. Stream channel condition: Dean Creek

Channel characteristic	Value	Percentile ranking	Condition
Number of pools / kilometer	57.0	Greater than 75th	Excellent
% channel area in pools	37.6	Between 25th and 50th	Fair
Pieces of wood per 1000 m^2	27.1	Between 50th and 75th	Good
Width-to-depth ratio	27.32	Between 50th and 75th	Fair

Management implications

The Dean Creek watershed lies entirely within a Timber Management LUD, and has been managed extensively for timber harvest, but fishpass construction in Dean Creek also represents a major investment in fisheries production. In addition to providing timber, this watershed is also a producer of coho salmon (*O. kisutch*) and pink salmon (*O. gorbuscha*), both of which support commercial fisheries in Southeast Alaska.

The low inherent sediment risk rating and the moderate current sediment risk rating suggest that this watershed is well-suited to timber harvest. However, with cumulative harvest levels reaching 33 percent of the area in the Dean Creek watershed it can be expected that harvesting additional acreage within the watershed will require accessing steeper, more difficult terrain, thereby assuming a greater risk of landslides. This underscores the need for avoidance of potentially unstable slopes when planning road locations and timber harvest units, diligent maintenance of open roads, and placing roads in storage when not needed for specific planned activities. It is not possible to say whether the below-average percentage of channel area in pools and the fair width-to-depth ratio are due to management activities, or simply a natural characteristic of these streams. Still, these stream channel characteristics indicate that careful management of sediment sources is important.

Opportunities for watershed improvement

Currently, 1.2 miles of Road 6427 are recommended for placing in storage when no longer needed for planned timber harvest activities. Placing roads in storage involves removing all culverts, excavating additional waterbars in the road surface, and allowing natural revegetation on the road and in the road ditch. This restores more natural drainage patterns and eliminates the risk of road failures at stream crossings, culvert plugging, and stream diversion. Natural revegetation further reduces the risk of sediment delivery to streams.

Kadake Creek Watershed

General

Kadake Creek (ADF&G #109-42-10300, Kuiu Watershed #142) drains a 32,270 acre watershed on North Kuiu Island. Two major forks, the South Fork and the North fork, converge and flow into Kadake Bay. Annual precipitation ranges from near 100 inches at the mouth of Kadake Creek to around 130 inches in the headwaters of the watershed (USDA Forest Service, 1979). The Kadake watershed lies partially in three different ecological subsections including the Rowan Sediments, Sumner Strait Volcanics, and the North POW-Kuiu Carbonates subsections (USDA Forest Service, 2001b).

Stream channels

The Kadake Creek Watershed is another that has a relatively large proportion, mile per mile, of streams in the Moderate-gradient Mixed-control and Flood Plain process groups (Chart C-14). The Kadake Creek Watershed lies between the 75th and 90th percentile for the density—calculated as length of stream per unit of watershed area—of these types of streams. This means that there is a high proportion of stream channels that are of high value for anadromous and resident fish habitat (Chart C-15). Because these streams have moderate to low gradient they may be susceptible to sediment-related changes in channel morphology, such as pool filling and widening. The Kadake Creek Watershed lies between the 75th and the 90th percentile for drainage density amongst Kuiu watersheds, which indicates that the watershed is efficient at routing water and sediment from headwater areas to low gradient streams in valley bottoms.

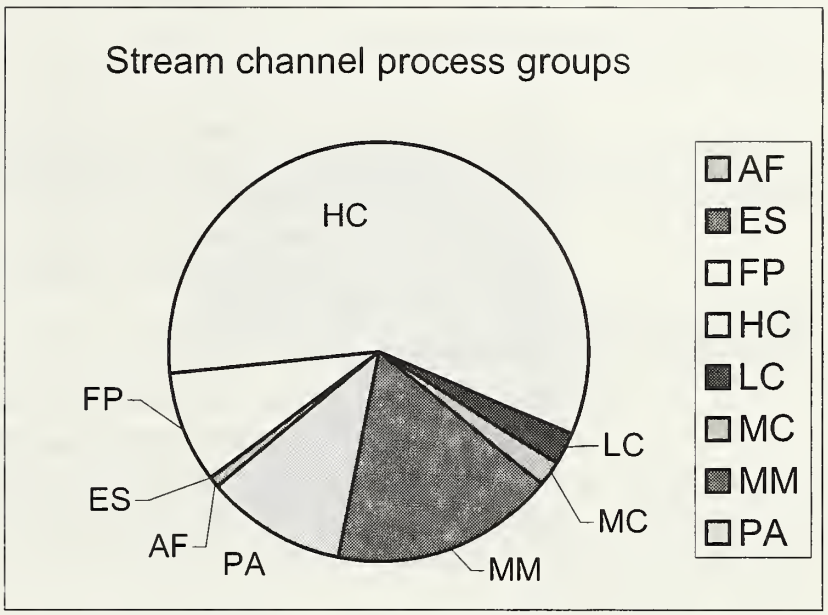


Chart C -14: Stream channel process groups in the Kadake Creek Watershed. AF = Alluvial Fan; ES = Estuary; FP =Flood Plain; HC = High-gradient Contained; LC = Large contained; MC = Moderate-gradient Contained; MM = Moderate-gradient Mixed-control; PA = Palustrine.

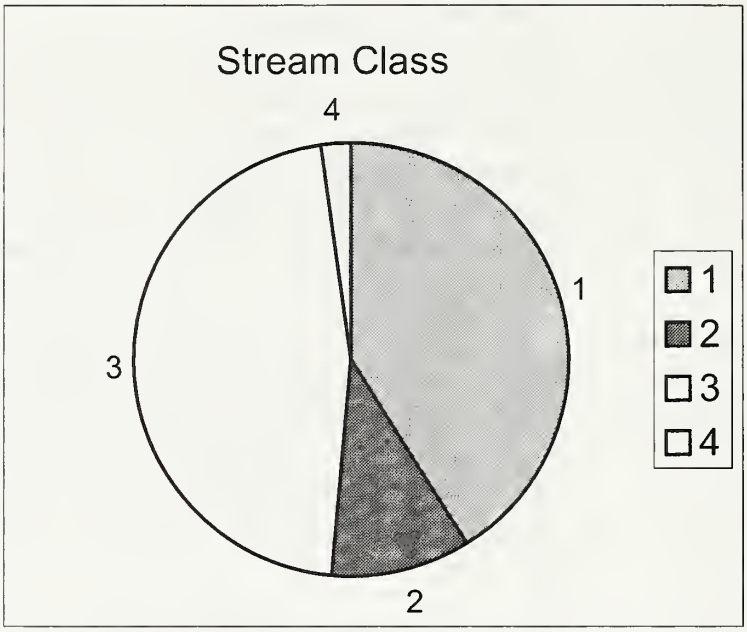


Chart C-15: Stream classes in the Kadake Creek Watershed: 1 = stream habitat that supports anadromous fish populations; 2 = stream habitat that supports resident fish populations; 3 = streams that do not support fish populations, but that deliver sufficient sediment and water to directly affect downstream fish habitat; 4 = streams that do not support fish or transport enough water and sediment to directly affect downstream fish habitat.

Harvest history

The Kadake Creek Watershed has a harvest history dating to 1915 (Chart C-16). Nineteen percent (6,151 acres) of this watershed has been harvested (after accounting for road clearings), but only 17 percent of the watershed has been harvested within the last 30 years. Riparian harvest totaled 410 acres or 1.3 percent of the watershed area.

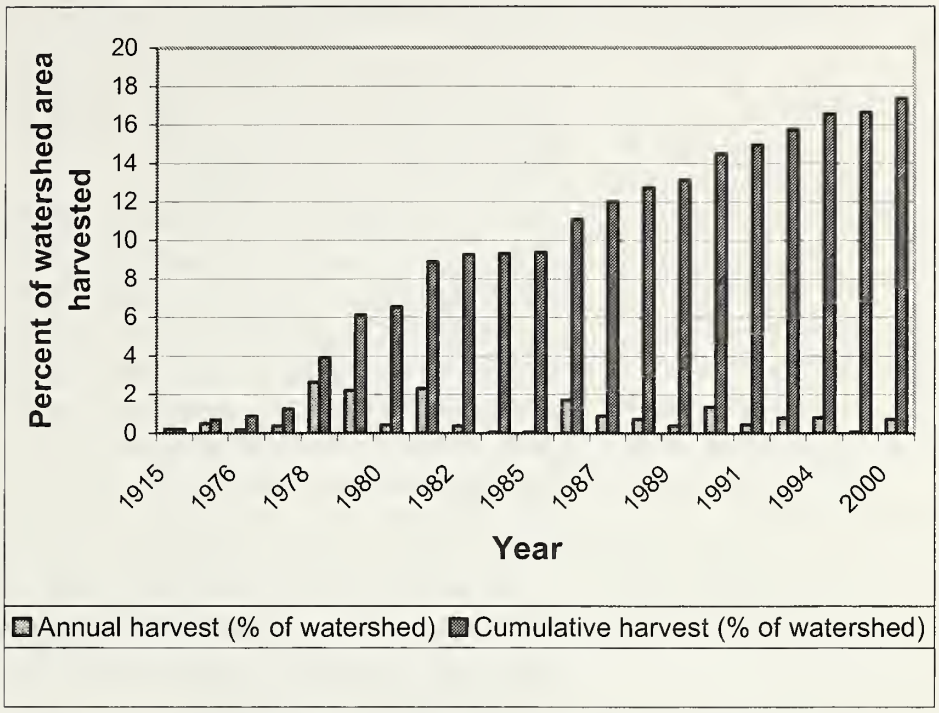


Chart C-16 Harvest history for the Kadake Creek Watershed. This figure does not account for timber harvested for road clearings.

Roads

There are a total of 78.4 miles of cataloged roads in the Kadake Creek Watershed. Road building in the Kadake Creek Watershed dates back to the 1960s.

Landslide inventory

The landslide inventory identifies 18 landslides in the Kadake Creek Watershed (Figure C-4) totaling 27.5 acres or less than one percent of the watershed. This puts the Kadake Creek Watershed between the 50th and 75th percentile for landslide density compared to other Kuiu Watersheds. The Kadake Creek watershed is between the 25th and 50th percentile for the proportion of the watershed lying on slopes in the high or very high Mass Movement Hazard (MMH) categories.

Sediment risk assessment

The sediment risk assessment for Kuiu Island identified the Kadake Creek Watershed as having a high inherent risk for sediment related changes in stream channel characteristics, compared to other Kuiu watersheds (Figure C-2). The risk rating increased to very high after accounting for harvest and road-building (Figure C-3). This increase indicates: 1) that the inherent characteristics of the watershed may make it susceptible to changes in stream channel condition if sediment supply is increased, and 2) that timber harvest and road building have increased the area of potential sediment sources within the watershed.

This does not mean that sediment-related changes to stream channels are expected, only that their likelihood has increased. The above average occurrence of landslides in the Kadake Creek watershed indicates that the high sediment risk rating is appropriate.

Stream channel condition

Stream channel characteristics were measured in an extensive survey of the main stream and its tributaries. Data reported here were taken in a four mile long reach of FP5 stream in the main stem of Kadake Creek. Kadake Creek was in poor condition for the number of pools; in excellent condition for the percentage of channel area in pools; and between fair and good condition for wood loading and width-to-depth ratio (Table C-17). The poor rating for number of pools, and excellent rating for percent of channel area in pools indicates that there are few pools, but that they are larger than average for a stream of this size. Both wood loading and width-to-depth ratio are average. Because the available stream channel condition data represent only a snapshot in time, it cannot be determined whether the poor number of pools represents a decrease in pools over time, or simply natural variability in stream channel conditions.

Table C-17 Stream channel condition: Main stem Kadake Creek

Channel characteristic	Value	Percentile ranking	Condition
Number of pools / kilometer	11	Less than 25th	Poor
% channel area in pools	69	Greater than 75th	Excellent
Pieces of wood per 1000 m^2	5	= 50^{th} percentile	Fair / good
Width-to-depth ratio	45	= 50^{th} percentile	Fair / good

Management implications

In addition to providing timber, the Kadake Creek watershed provides recreation opportunities, and is important for fisheries production. Kadake Creek is recognized locally as one of the top steelhead trout (*O. mykiss*) fisheries in the area, and a recreational cabin in Kadake Bay managed by the Forest Service draws both local and out-of-state steelhead fishermen. Kadake Creek is also an important producer of coho salmon (*O. kisutch*) and pink salmon (*O. gorbuscha*), both of which support commercial fisheries in Southeast Alaska.

The Kadake Creek river corridor is designated as a Recreational River. Although timber harvest is allowed within Recreational River Corridors, deferring timber harvest within the corridor may enhance

the recreation experience for fishermen and other recreationists expecting to see a natural setting within the river corridor.

The high and very high SRI ratings for the Kadake Creek watershed and the high occurrence of landslides suggests that appropriate management in the Kadake Creek Watershed would include strict avoidance of potentially unstable slopes when planning road locations and timber harvest units, diligent maintenance of open roads, and placing roads in storage when not needed for specific planned activities. It is not possible to say whether the poor number of pools is due to management activities, or simply a natural characteristic of these streams. Still, this stream channel characteristic indicates that careful management of sediment sources is important. With cumulative harvest levels approaching 20 percent of the area in the Kadake Creek Watershed it can be expected that harvesting additional acreage within the watershed will require accessing steeper, more difficult terrain, thereby assuming a greater risk of landslides. This further underscores the need for careful planning and maintenance.

Watershed improvement opportunities

Planning has begun for a project that aims to improve stream channel conditions on a tributary of Kadake Creek. Recurring problems with culvert plugging at a stream crossing on Road 6415 resulted in the tributary being diverted into a road ditch. The road was recently re-routed to a better location to avoid future problems. Some of the old road fill has been removed, but the stream has now established a new channel, which runs along the old roadbed for about 500 feet, and then through the forest on an alluvial fan. During periods of low rainfall the stream runs dry along the road bed causing mortality for rearing coho salmon. The coarse, angular road fill contributes to the dewatering of the stream because the bottom of the stream bed is perched above the water table. The proposed project calls for removing the road fill that remains in the current stream channel and excavating a stream channel that resembles a properly functioning reference reach. This is expected to alleviate the drying of the stream channel by bringing the channel bed down to an elevation near the water table. This project is expected to result in a reconstructed stream channel that maintains surface water flow, has a natural appearance and function, and maintains a stable form. This is expected to improve fish habitat and reduce the mortality of rearing coho salmon.

There are 410 acres of harvested riparian areas in the Kadake Creek watershed that need to be evaluated for thinning opportunities. Thinning treatments would promote the development of large conifers that would eventually be recruited into the stream channel. This may be an appropriate way to improve the number of pools in Kadake Creek in the future. Thinning of riparian stands may also have other benefits, particularly for wildlife.

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Appendix C-1: The Sediment Risk Assessment

Watersheds with higher drainage densities tend to have more highly-developed drainage networks which can efficiently transport water and sediment downstream (Gordon et al., 1992; Marston, 1978). The SRA assumes that watersheds with higher stream densities have a greater potential to route sediment to downstream reaches. Drainage Efficiency is estimated using stream drainage density (length of stream per area of watershed).

Steep watersheds with higher percentages of unstable soils are assumed to represent a greater sediment risk. Areas of high and very high mass movement potential are assumed to be potential sediment sources for input to stream networks. Mass Movement Potential is evaluated using the mass-movement index (MMI) for soils within the watershed (USFS, 1997). The MMI is based on the steepness and soil drainage characteristics of each soil series.

Recent timber harvest is assumed to increase the potential for mass movement (Swanston and Marion, 1991), and roads are assumed to increase sediment inputs to streams (Sullivan *et al.*, 1987). Therefore watersheds with higher percentages of potential source areas are assumed to represent greater sediment risks.

The equation for the sediment Input Potential Index (IPI) is:

$IPI = D * (MM + H_e + R_e) / A$

Eqn. 1

where:

IPI = Sediment Input Potential Index for the watershed

D= Drainage density = Total stream length / Watershed area

A= Area of the watershed

MM = Watershed area within high mass movement potential soils

H_e = Existing harvested area within the watershed

R_e = Existing road area within the watershed

To facilitate comparison among watersheds, the IPI and drainage density were scaled to unitless values between 0 and 100, which can be presented on the same scale as percent high mass movement soils, harvest and roads.

The Storage Potential Index (SPI) for each watershed is based on the density of streams which tend to retain sediment (generally low to moderate gradient with unconsolidated bed and bank material). In southeast Alaska, these streams are divided into categories of *depositional* and *transitional* based on the Channel Type User Guide for Southeast Alaska (USFS 1992).

Depositional streams are defined as those channel types with high sediment retention capacity (*i.e.*, flood plain, estuarine, palustrine and alluvial fan channels). They are considered to have higher impact risk because they are low-gradient channels (less than two percent) that tend to retain sand, gravel and coarser sediment for medium to long term storage. As a result, sediment introduced from upstream disturbance can result in pool filling, bank erosion, channel-widening, accelerated bar development and other channel adjustments.

Transitional streams are defined as those channel types with moderate sediment-retention capacity (*e.g.*, moderate-gradient, mixed control channels). These streams generally have gradients of 2-6 percent with coarse, gravel/cobble/boulder substrate. They are considered lower risk than depositional channels because: 1) they tend not to retain large amounts of fine sediment and gravel, and 2) the stream bed and banks contain higher proportions of stable substrate. The Storage Potential Index has the formula:

Eqn. 2: $SPI = (S_{dep} + 0.25S_{trn})/A$

where: SPI = Storage Potential Index

S_{dep} = length of depositional streams

S_{trn} = length of transitional streams

A = Watershed area

Similar to the transport index, the SPI and component indices (depositional and transitional stream densities) are arithmetically scaled between 0 and 100.

Sediment Risk Index

A combined Sediment Risk Index (SRI) is developed based on storage potential and transport potential indices for each watershed. The equation for the Sediment Risk Index is:

Eqn. 3: $SRI = (TPI \times SPI)^{1/2}$

where: SRI = Sediment Risk Index

IPI = Input Potential Index

SPI = Storage Potential Index

The SRI is defined as the geometric mean of the IPI and SPI. If there are no depositional or transitional streams in the watershed, the SPI and SRI become zero. In southeast Alaska, this situation is common in small, steep, low-order coastal watersheds with short flowpaths to saltwater and little or no in-stream storage capacity. In this situation, the risk of impact is assumed low because sediment is transported quickly to the ocean and has limited opportunity to cause long-term, sediment-related channel adjustments. Similarly, the TPI is low in flat terrain with few streams per acre. In this situation, the potential for sediment mobilization and transport is low, even though storage potential may be high. Since both the IPI and SPI are numbers between 0 and 100, the geometric mean gives each term equal weight and makes the SRI an index between 0 and 100.

Appendix C-2: Ecological Subsections

Ecological subsections are mapping units of geographic areas of similar physiography, lithology, and surficial geology ranging in size from 10 to 1,000 square miles (USDA Forest Service, 2001b). The project area spans four different ecological subsections including the Rowan Sediments, Sumner Strait Volcanics, Kuiu-POW granitics, and North POW-Kuiu Carbonates subsections.

The Rowan Sediments Ecological Subsection is characterized by well-rounded hills dissected by U-shaped glacial valleys. Bedrock is sedimentary mudstones, graywackes, and turbidites which weather to form well-drained silty or loamy soils that are highly productive. Spodosols and Histosols are the dominant soil orders comprising 78 percent and 20 percent, respectively, of this ecological subsection. Spodosols are acidic forest soils occurring in readily-leached coarse-textured parent materials, whereas Histosols are organic soils that occur in anaerobic wetland environments (Brady, 1999). Thick deposits of glacial till, often with poorly drained organic soils, are common in this subsection as well.

The North Prince of Wales—Kuiu Carbonates are characterized as karst lands, with unique topographic features attributable to the physical properties of carbonate bedrock (limestone and marble). Cliffs, caves, fractures, shafts and pits are common features that comprise complex underground drainage systems. Soils are shallow but well-drained and very productive, except where compact glacial till lies in surface deposits. Histosols and Spodosols are the dominant soil orders comprising 63 percent and 29 percent respectively.

The Sumner Strait Volcanics subsection is a rolling landscape characterized by benched hills and lava plateaus. Slopes are gentle, except where they cut across the direction of lava flows. These slopes are steep, with actively eroding gullies that supply large amounts of bedload sediments to streams. Histosols and Spodosols are the dominant soil orders comprising 61 percent and 37 percent respectively. Unstable soils originating from pyroclastic materials in this subsection warrant careful management.

The Kuiu-POW Granitics are intrusive rock bodies, primarily granite and granodiorite, characterized by steep and relatively high mountains. Alpine areas above 2,000 feet receive abundant snowfall which feed streams well into the summer months. Soils are characterized as shallow to very shallow, rocky, and well-drained. Spodosols and Histosols are the most common soil orders comprising 54 percent and 32 percent, respectively.

The Alvin Bay Sediments form a series of rugged hills along the spine of southcentral Kuiu Island from No Name Bay through Port Beauclerc. They also occur on the southwest corner of Kuiu Island, where short, broken, and irregular hillslopes descend from well-rounded summits to coastal lowlands—topographic features typical of heavy past glaciation. Sedimentary rocks of various grades of graywackes have glacial deposits smeared over much of them. Shallow to moderately deep soils occupy upper slopes and hilltops, whereas deeper colluvial soils occur along toe slopes. These well-drained soils are quite productive and support extensive forests of western hemlock and western hemlock-Alaska yellow cedar. Poorly drained mineral and organic soils occur among the coastal lowlands and mineral and organic soils occur among the coastal lowlands and on gentle hill slopes. These wet soils occupy over one-third of the landscape and support mixed conifer and lodgepole pine forests and marshy shrublands. The area receives moderately high amounts of precipitation. High gradient contained streams cascade down the hills following bedrock joints and faults. The gradient and containment of streams lessen as they spill onto coastal lowlands and floodplains. Less than two percent of the productive forest lands have been harvested for timber. There are no roads in this subsection, and most of the area is designated as wilderness. Spodosols and Histosols are the most common soil orders, comprising 63 percent and 35 percent, respectively.

The Affleck Canal Till Lowlands form the glacially-striated peninsular lobes of southern Kuiu Island which distinctly mark the direction of ice movement across this area. These low-lying terrains encompass broad undulating lowlands and gently rolling hills. Some moderate to steep hillslopes occur adjacent to beachfronts. Sedimentary rocks, principally graywacke, lie close to the surface in many places due to heavy glacial scour. Much of the area is smeared with a thin veneer of glacial drift and till. Poorly-drained mineral and organic soils abound, supporting an intricate array of forested wetlands of mixed conifer and lodgepole pine and shrubby bogs and fens. Moderately high levels of precipitation supply water to this vast wetland complex that altogether covers 70 percent of the area. More productive stands of hemlock occur on steeper, better-drained hillslopes where incised streams flow. Moderate gradient streams flow through the lowlands. Timber harvest and roads are virtually nonexistent in this subsection, and the area is largely protected through Wilderness designation.

USDA Forest Service
Petersburg Ranger District, Tongass National Forest
PO Box 1328
Petersburg, AK 99833