Chapter 3

Environment and Effects

Chapter 3

Environment and Effects

Introduction

This chapter describes the existing environment of the Navy project area and potential environmental effects of the alternatives. Effects are evaluated and quantified where possible; qualitative discussions are also included. The discussions of resources and potential effects uses existing information included in the 1997 Tongass Land and Resource Management Plan Final Environmental Impact Statement (1997 Forest Plan Final EIS), 2008 Tongass Land and Resource Management Plan Final Environmental Impact Statement (2008 Forest Plan Final EIS), project-specific resource reports, and related information sources as indicated. Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record for the Navy project includes all project-specific information including resource reports, field data, and public involvement. The planning record is located at the Wrangell Ranger District Office in Wrangell, Alaska, and is available for review during regular business hours.

Land Divisions

The land area of the Tongass National Forest (Tongass) has been divided in several different ways to describe the resources. These divisions vary by resource since the relationship of each resource to geographic conditions and zones varies. The allocation of Forest Plan land use designations (LUDs) (discussed in Chapter 1, Figure 1-2) is one such division.

Project Area

The project area was mapped by the interdisciplinary team (IDT) to define the boundary of the area where the project will occur. The project area is about 77,500 acres, all National Forest System land.

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 watershed divides. The Navy project area includes portions of value comparison units (VCUs) 4640, 4650, 4660, 4670, and 4680. Chapter 2 includes a map (Figure 2-1, Alternative A map) showing their location.

Wildlife Analysis Areas (WAAs)

This land division corresponds to the harvest areas used by the Alaska Department of Fish and Game (ADF&G) to report community harvests of selected wildlife species. The project area includes part of Wildlife Analysis Area (WAA) 1901. Information estimated by WAA was used in the wildlife and subsistence analyses.

Watershed

Watershed refers to the area that contributes water to a drainage or stream or to that portion of a landscape in which all surface water drains to a common point. Watersheds can range from a few 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. Figure 3-16 displays the location of the watersheds within the Navy project area.

Inventoried Roadless Area (IRA)

Inventoried roadless areas are undeveloped areas typically exceeding 5,000 acres, and that met the minimum criteria for wilderness consideration under the Wilderness Act. These were inventoried during the Forest Service Roadless Area Review and Evaluation process, subsequent assessments, or forest planning. Roadless areas were updated in 2003 during the analysis for the Final Supplemental Environmental Impact Statement (SEIS) to the Forest Plan. Portions of Inventoried Roadless Areas 232 (North Etolin), 233 (Mosman), and 234 (South Etolin) (Figures 3-7 and 3-8) are within the Navy project area. The Roadless Area analysis in this Final Environmental Impact Statement (Final EIS) used the 2003 inventory.

Biogeographic Province

The biogeographic province refers to 21 ecological subdivisions of Southeast Alaska that are generally identified by distinct ecological, physiographic[1], and biogeographic[2] features. The Navy project is included in the Etolin Island biogeographic province. Effects of management at this scale are analyzed as part of the Forest Plan.

Analyzing Effects

Environmental effects are the effects of implementing an alternative on the physical, biological, social, and economic environment. The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) includes the following specific categories to use for analyzing environmental effects.

Direct environmental effects occur at the same time and place as the initial cause or action.

Indirect effects occur later in time or are spatially removed from the activity.

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 actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time.

Cumulative Effects

The following list includes past, present, and all reasonably foreseeable future activities that may have been used in the analysis for this project. Human activities

[1]Physiographic means the branch of geography that studies the natural features of the Earth's surface as well as their formation.

[2] Biogeographic means the study of the geographic distribution of plants and animals.

such as subsistence use, personal use timber, and recreation have been ongoing and it is assumed they will continue into the future.

Several activities are not expected to contribute to cumulative effects for any resource:

- State of Alaska Steep Pass in Navy Creek (non-functioning fish pass)
- Navy Creek stream gauge (not functioning)
- Hazardous waste clean-up
- Canoe portage at the head of Burnett Inlet
- Historic land use (i.e. fur farm, canneries)
- Elk introduction

Where other past management activities may contribute to cumulative effects, they are discussed under the affected resource sections:

- Past timber management activities in the Navy project area include about 4,100 acres that have been harvested using even-aged management. Most of this harvest occurred between 1983 and 1999.
- The Starfish Timber Sale was offered to the Ketchikan Pulp Company under their long-term contract, and the Granite, Quiet, Etolin, Camp Mossy Timber Sales, and miscellaneous small sales were prepared under the Wrangell Ranger District Timber Sale Program.
- Beach clearcut logging and individual tree hand logging has occurred in various locations along the shoreline.
- Silvicultural treatments include planting, pruning, thinning, and burning.

The Forest Service views reasonably foreseeable future actions as actions that are currently planned or scheduled to occur. Present and reasonably foreseeable future actions include the following:

- The Porcupine Salvage Timber Sale authorized the salvage harvest of approximately 766 thousand board feet (MBF) of blown down sawtimber and utility volume from 26 acres. This project does not authorize any new road construction. This sale was sold in January 2009.
- Fishtrap Salvage Timber Sale authorized the harvest of approximately 208 MBF of cedar decline and blown down sawtimber and utility volume from 240 acres adjacent to existing roads. This sale was sold in 2007.
- North Etolin Salvage Timber Sale authorizes the harvest of approximately 200 MBF of cedar decline and blown down sawtimber and utility volume along the existing road system. This sale, which had a decision in August 2008, is located on the Honeymoon road system (Road 6549), outside the project area.
- Wrangell District Roadside Timber Sales would authorize salvage harvest of dead, dying, and blowdown timber and green fuelwood and sawtimber small sales along the existing road systems of Wrangell, Zarembo, and Etolin Islands. This project may result in multiple small sales and microsales whose total combined volume would not exceed a total of 5 MMBF from the three islands combined over multiple years. A limit of how much volume per year would be harvsted is part of the proposed action. The project proposal was added to the SOPA in January 2009 and scoping has begun.

- Maintenance and repair of existing NFS roads is an ongoing process that occurs on a periodic basis.
- Road closure projects.
- There is a proposal to widen the Anita Bay North log transfer facility (LTF) lower barge ramp and widen the roadway between the current parking lot (old campsite) and the Anita Bay North LTF.
- Silvicultural treatments including pre-commercial thinning, yellow-cedar release thinning, and wildlife habitat enhancement.
- Special use permits including the Cannery Cove waterline permit, Oyster Farm, outfitter/guide permits, Burnett Creek hatchery permit, and communication site permit on an unnamed peak north of Burnett Lake.

All the land within the project area is NFS land. The State has two areas on Etolin Island (McHenry Anchorage and Olive Cove) that were considered as part of the wildlife analysis. The State has no planned harvest in the reasonably foreseeable future.

Unavoidable Adverse Effects

Implementation of any alternative could cause some adverse environmental effects that cannot be effectively mitigated. Unavoidable adverse effects often result from managing the land for multiple resources. Many adverse effects can be mitigated by limiting the extent or duration of effects. The interdisciplinary procedure used to identify specific harvest units and roads was designed to eliminate or lessen significant adverse consequences. The application of Forest Plan Standards and Guidelines, best management practices (BMPs) and project-specific mitigation measures are all intended to limit the extent, severity, and duration of potential effects. Such measures are discussed throughout this chapter. Regardless of the use of these measures, some adverse effects could occur. The purpose of this chapter is to disclose these effects.

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 and the National Forest Management Act, all renewable resources are to be managed in such a way that they are available for future generations. By meeting Forest Plan Standards and Guidelines, this project meets the requirements of the Multiple-Use Sustained-Yield Act and the National Forest Management Act.

Irreversible and Irretrievable Commitments

Irreversible: This term describes the loss of future options. Irreversible applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors such as soil productivity that are renewable only over long periods.

Irretrievable: This term applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is serving as a winter sports site. The production lost is irretrievable but the action is not irreversible. If the use changes, it is possible to resume timber production. Generally, timber harvest and associated activities are considered irretrievable commitments of resources.

Available Information

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

There is incomplete knowledge about many of the relationships and conditions of wildlife, fish, forests, jobs, and communities. The ecology, inventory, and management of a large forest area are complex and developing sciences. The biology of wildlife species prompts questions about population dynamics and habitat relationships. The interaction of resource supply, the economy, 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 deciding official to make a reasoned choice between the alternatives, and to adequately assess and disclose the possible adverse environmental effects.

Resources Not Discussed in Detail

Climate Change

Climate change will not be discussed in detail. The 2008 Forest Plan discusses the risk of possible effects and the considerable uncertainty concerning specific predictions of how the climate may change, and even more uncertainty regarding the effects of climate change on the resources of the Tongass. In this context, climate change is not essential to a reasoned choice among the alternatives considered in the Navy project analysis. The Tongass National Forest will continue to monitor potential effects of climate change through the existing Forest Plan monitoring programs, and other studies that are happening regionally and nationally. Any needs for a different course of action that might alter effects will be addressed through existing planning procedures to determine whether changes in the Navy project management are warranted.

The EIS completed for the 2008 Tongass Forest Plan contains an extensive discussion of the climate change related to management activities (pgs. 3-11 to 3-20, 3-50 to 3-51, 3-77, 3-92 to 3-93, 3-116 to 3-117, 3-125 to 3-126, 3-203, 3-250, 3-296, 3-340, 3-351, 3-401). It describes the current considerable variability and uncertainty of outcomes possible because models available for estimating climate change are designed to predict changes on regional scales, and are not detailed enough to predict changes to the Tongass National Forest. Existing models do not agree on how global warming will affect Southeast Alaska, and the variation and possibilities are discussed extensively in the 2008 Forest Plan EIS.

The 2008 Record of Decision for the 2008 Forest Plan concludes that continued management of the Tongass National Forest will be through adaptive management. This will allow for resiliency in the face of uncertain but anticipated change will be accomplished primarily by management of the Tongass as a mostly intact ecosystem with a robust monitoring plan that will allow for intervention, if/when effects of climate change are more certain. Important components of the 2008 Tongass Forest Plan include:

- A conservation strategy that includes an extensive reserve system in non-development land use designations, and standards and guidelines where active management is minimized that protect over 90 percent of the existing productive old-growth habitat.

- Standards and guidelines that include protection for soils, such as limits on harvest on steeps slopes, limits on roads built across steep slopes, and limits on soil disturbance that will help retain carbon stored as organic material in soils where timber harvest and road building occur.

In addition to the Forest Plan's monitoring and evaluation provisions that have been updated to address the effects of climate change, there are Regional forest health program monitoring changes related to insects, disease, pathogens and windthrow and the long-term forest inventory system. If these efforts detect effects from climate changes, they will be addressed through existing planning procedures to determine whether changes in management are warranted.

Air Quality

No significant effects on global carbon sequestration levels are expected under any of the alternatives considered for the 2008 Forest Plan Final EIS. Therefore, it is reasonable to conclude that small changes (project level) in carbon sequestration on the Tongass, whether positive or negative, would have a minor effect on atmospheric carbon levels. All of the action alternatives would have limited, short-term effects on ambient air quality. Such effects, in the form of vehicle emissions and dust, are likely to be indistinguishable from other local sources of airborne particulates, including other motor vehicle emissions, dust from road construction and motor vehicle traffic, residential and commercial heating sources, marine traffic, and emissions from burning at sawmills. The action alternatives could result in short-term supplies of raw wood products to local mills. It is the responsibility of the mill owner or sort yard operator to ensure that mill emissions are within legal limits. Air quality is discussed in the Old Growth and Biodiversity section of the 2008 Forest Plan Final EIS.

Environment and Effects By Significant Issue

The Council on Environmental Quality (CEQ) issues guidance to Federal agencies to determine the significant issues concerning any proposal and to eliminate those issues that are not significant or that are outside the scope of this document. With the help of the public and other agencies, the Forest Service has identified three issues (see Chapter 1) to be examined in detail for the proposed project. The following sections describe the environmental effects of each alternative by issue. Where appropriate, effects to other resources are discussed in this chapter.

Issue 1: Timber Supply and Economics

The extent to which timber harvest in the project area may improve local and regional economies.

Concerns were expressed from the public regarding the validity of this sale due to a perceived lack of demand, questionable economic viability, the amount of economically viable timber offered by the Forest Service, the economic burden placed on taxpayers to fund timber sales, and the need to provide jobs and support for the local economy. Some members of the public are of the opinion that there is no economic demand for timber while others are of the opinion that there is an economic demand for timber.

Introduction

Determining market demand is a complex process. Detailed explanations of the rationale for considering timber harvest in the Navy project area and market demand for wood products at the local and regional scales is located in Appendix A of this document. More information on "Market Demand" can also be found in the Forest Plan Record of Decision, pages 29-37.

The 2008 Forest Plan Timber Sale Adaptive Management Strategy limits the lands available for timber harvest to that necessary to support demonstrated levels of demand. A detailed discussion of this strategy can be found in the Forest Plan Record of Decision, pages 64-70.

This strategy has been incorporated into the Navy Final EIS. The Navy project area falls within the Phase 1 and Phase 2 areas. The Navy Lake watershed is located in a Phase 2 land area. For the Navy Final EIS, harvest units in this area will be deferred until criteria for Phase 2 is met. Proposed harvest acres in the Navy Lake area for the Navy Draft EIS amounted to about 830 acres, or 15.7 MMBF net sawlog volume. This includes about 3 miles of proposed road construction and a new marine access facility.

Measurements:

- Amount of timber volume offered for sale (MMBF)
- Indicated bid value ($/MBF)
- Employment opportunities supported (number of annualized jobs)
- Logging and road costs per thousand board feet (MBF)

The Region 10 NEPA Economic Analysis Tool Residual Value (NEAT_R) version 2.15 was used to analyze the financial efficiency of a range of alternatives developed by the interdisciplinary team (IDT) for the Navy project. Inputs include current timber selling values, logging costs and road construction costs. The measurements are generated outputs of the NEAT_ R program, including volumes and indicated bid value, number of jobs created, costs, revenues and income.

Analysis Area

The direct and indirect effects area analyzed for this issue includes the Southeast Alaska communities of Wrangell, Ketchikan and Prince of Wales Island. The businesses in these communities would likely supply employees, goods and services

necessary to implement a timber sale project. The cumulative effects analysis area includes the Tongass National Forest; see Appendix A.

Summary of Effects

The Navy project would provide up to 87 million board feet of lumber and 487 jobs for local mills. Local mills need a continuous supply of wood to operate efficiently and produce lumber to meet market demand. The project would provide needed revenue and jobs to surrounding communities. Alternative C has the greatest effect in terms of jobs created, revenue generated, and amount of volume contributing to supply.

Affected Environment

Communities Economic Base

Employment in the Wrangell Vicinity

The community most affected by this project would be Wrangell. The communities on Prince of Wales Island, and Ketchikan, would also likely be affected, as there are a number of people from there who work in the forest industry. Silver Bay Logging Company owns the sawmill in Wrangell and Pacific Log and Lumber Company owns the sawmill in Ketchikan. The Viking Lumber Company sawmill is located in Klawock on Prince of Wales Island. The businesses in these communities would likely supply the goods and services necessary to implement a timber sale project. Many of the employees needed for this project reside in these communities.

Additional smaller mills exist on Wrangell Island and on Prince of Wales Island. These mills could utilize some of the leftover or superfluous material from the larger mills. Niche markets exist locally, such as cedar shake and siding production, music wood production and firewood procurement.

The Forest Plan Amendment Final EIS, Volume I, Chapter 3 provides detailed Community Assessments for Wrangell, Ketchikan, and communities on Prince of Wales Island.

Wrangell is a historic community that lies next to the Stikine River on the northern tip of Wrangell Island. The Alaska Department of Labor and Workforce Development population estimate for Wrangell's population is 1,911, down 397 people, or 17 percent from the 2000 Census, and down 568 people, or 23 percent, from the 1990 Census of 2,479 residents. Commercial fishing, fish processing and the timber industry have been the economic foundation of the community. After the closure of the Alaska Pulp Corporation (APC) sawmill in 1994, the timber-related economy steadily declined.

The APC mill was sold to Silver Bay Logging and reopened in 1998. In 2000, the mill processed approximately 14 MMBF. In 2003, Silver Bay Logging filed bankruptcy and operated at a diminished capacity through 2007. During 2004 and 2005, the company processed 3.4 and 8.7 MMBF. The mill has not been operating in 2008 and is presently in negotiations for a possible sale and ownership turnover. According to the mill capacity and utilization studies conducted by the Juneau Economic Development Council, the Silver Bay Logging mill has an installed production capacity of 65 MMBF. Sawmill employment in Wrangell has decreased by 133 jobs, or 82 percent, from 162 jobs in 1990 to 55 jobs in 2000. Mill jobs in Wrangell further fell to 29 jobs in 2005.

The cornerstones of Wrangell's present-day economy include commercial fishing, fish processing, education, health services, government, tourism, and timber. Fishing and hunting are important subsistence and recreational activities for area residents, and provide employment and income for residents involved in outfitting, and guiding services.

Forest Products Employment

The forest products industry has been an important part of the economy of Southeast Alaska since the 1950s. Recent forest products employment data are presented in Table 3-1.

Table 3-1
Forest Products Industry Employment in Southeast Alaska 2002 to 2006

Year[1]	Tongass Logging[2]	Sawmill	Tongass- Related Employment[3]	Other Sawmill	Other Logging	Total Industry Employment[4]
2002	63	110	173	40	299	512
2003	108	91	199	64	298	561
2004	82	95	177	53	220	450
2005	88	96	184	52	263	499
2006	81	77	158	46	217	421

[1] Calendar years
[2] Tongass National Forest logging estimated based on the ratio of Tongass timber harvest to total timber harvest in Southeast Alaska.
[3]Data from Kilborn and others (2004) and from subsequent mill studies show that Federal timber supplied 73 percent of the wood sawn in Southeast Alaska mills in 2002, 59 percent in 2003, 64 percent in 2004 and 65 percent in 2005. Tongass National Forest sawmill employment from 2002 through 2005 is estimated based on sawmill employment numbers and the ratio of sources of wood (Federal versus the total) reported by Kilborn et al. (2004) and Brackley et al. 2006 and in mill studies by the Juneau Economic Development Council.
[4]Beginning in 2001, employment estimates are being published under a new classification system. The Standard Industrial Classification (SIC) system has been replaced by the North American Industrial (NAI) Classification system. "Sawmill" in this table is reported by the Alaska Department of Labor as "wood manufacturing" which in the NAI system includes sawmills, wood preservation, veneer, plywood, engineered wood, and other wood products. In Southeast Alaska, this category is assumed to represent only sawmill employment.
Source: Alaska Department of Labor

Payments to the State of Alaska

From FY 2001 through 2007, under the Secure Rural Schools and Community Self Determination Act of 2000, affected Alaska boroughs and communities chose to receive a payment amount based on the average of the highest three payments made to the state during the 14-year period between 1986 and 1999. As a result, the State of Alaska received payments of approximately $9 million per year from 2001 through 2007, primarily for schools and roads, with provisions for special project funding to boroughs who decide to convene citizen Resource Advisory Committees (RACs).

On October 3, 2008, H.R. 1424 became Public Law (P.L.) 110-343. Section 601 in Division C of H.R. 1424 reauthorized and amended the Secure Rural Schools and Community Self-Determination Act of 2000 as originally enacted in P.L. 106-393. The new law contains a complex new payment formula and other significant changes. The reauthorization of the Secure Rural Schools Act will provide over $1.7 billion in

funds over the next four years to counties and boroughs nationwide. As of November 2008, the estimated payment to the Wrangell borough will be $4.8 million from 2009 through 2012, most of which will fund roads and schools. More information is available at http://www.fs.fed.us/srs/.

Environmental Consequences

Financial Efficiency Analysis

A financial efficiency analysis is a comparison of costs and benefits that can be quantified in terms of actual dollars spent or received, or number of jobs created. This type of analysis does not account for non-market benefits, opportunity costs, individual values, or other values, benefits, and costs that are not easily quantifiable, such as one's value of untouched forestland. This is not to imply that such values are not significant or important, but to recognize that non-market values are difficult to represent by appropriate dollar figures. Therefore, financial efficiency should not be viewed as a complete answer, but as a tool decision makers can use to gain information to evaluate alternatives and trade-offs between costs and benefits.

Although individual harvest units may not be economical, the management of less-productive land will likely increase future timber yields. The harvest of units with higher value can help compensate for less-economical harvest units. The NEPA Economic Analysis Tool Residual Value (NEAT_R v2.15) was used to evaluate the alternatives for the Navy project (Table 3-2). Logging costs used in the NEAT_R program are current costs used in the Alaska Region's appraisal program. The costs and values reflect data updated as of 3rd Quarter 2007. Values used in NEAT_R include adjustments for the limited interstate shipping policy. This policy authorizes the shipment to the lower 48 States of unprocessed Sitka spruce and western hemlock sawlogs that are: a) smaller than 15 inches in diameter at the small end of a 40-foot log, or b) grade 3 or grade 4 logs of any diameter. Shipments will be limited on each sale to a maximum of 50 percent of total sawlog contract volume of all species, including western redcedar and Alaska yellow cedar, unless the Regional Forester grants an exception in advance based on case-specific circumstances.

The road construction costs are engineer's estimates for linear grading construction. The Navy Transportation Report contains additional information about linear grading. For the Navy project analysis, $160,000/mile was used for new system road construction; $110,000/mile was used for temporary road construction; and the road reconstruction cost was based on the amount of work required to bring roads up to hauling condition. The log transfer facility (LTF) construction cost in Alternative C was estimated at $50,000.

Table 3-2
Financial Efficiency Analysis - Alternative Volumes, Costs, and Values

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Sitka spruce (MBF)	0	8,384	16,072	6,667	7,432	3,310
Hemlock (MBF)	0	21,083	39,619	17,506	17,372	8,466
Alaska yellow-cedar (MBF)	0	4,356	9,091	3,367	3,954	1,778
Western redcedar (MBF)	0	5,514	11,044	4,539	4,440	2,251
Total Net Sawlog (MBF)[1]	**0**	**39,338**	**75,826**	**32,079**	**33,198**	**15,806**
Utility Volume (MBF)	0	6,193	11,673	5,110	5,160	2,481
Pond log value/MBF	$0	$317	$320	$308	$319	$312
Logging cost stump-mill/MBF	$0	$459	$483	$451	$479	$400
Indicated bid value [2]	$0	$(5,585,996)	$(12,409,638)	$(4,589,126)	$(5,322,028)	$(1,398,365)
Indicated bid value/MBF [2, 3]	$0	$(142.00)	$(163.65)	$(143.06)	$(160.31)	$(88.47)

[1] some numbers may not total due to rounding
[2] ( ) indicates negative value
[3] NEAT_R version 2.15 incorporating the limited interstate shipping policy.
Source: G. Roberts, NEAT_R version 2.15, 3rd Quarter 2007

The harvest volumes, indicated value, costs and net stumpage values used in this document are current estimates. These estimates are useful for comparing the relative differences among alternatives. As shown in the table above, the indicated bid values for all action alternatives are currently deficit. This is not to say that these alternatives may not become more economical in future markets, or that a portion of the units may be economical in current markets. A complete timber sale appraisal is necessary to determine the actual economics of the timber offered for sale. Timber offered for sale is cruised to determine the quantity, quality and value for the contract. The final sale appraisal will include current quarter selling values, current cost information and a normal profit and risk allowance to determine a minimum acceptable bid. No timber sale would be offered if it appraised deficit.

Opportunities to Improve Economics

Many variables can increase the cost of timber sale offerings and may carry significant economic risk for potential purchasers. Increased costs can be incurred due to road construction methods, helicopter yarding, certain silvicultural prescriptions, limited operating periods, and other factors. All of the alternatives for the Navy project include helicopter yarding. Those increased costs affect the selling value of the timber included in the alternatives. The value of the sawn products from the timber for sale must be sufficient to cover the stump to truck costs, transportation and milling costs, and offer a potential for profit to purchasers.

Some factors that typically enhance economics include an existing road system and log transfer facility, a relatively high proportion of conventional cable and shovel logging systems, proximity to processing facilities, and uneven-aged management prescriptions that selectively cut for value.

Optional removal provisions, which allow utility volume to be left in the woods, may be added to a timber sales contract to make the appraisal more positive. The NEAT_R program also amortizes all costs of road construction over the timber volume removed. Public works funds may be available to construct roads needed to access and haul

timber, but this option is not included in the economic analysis (NEAT_R) for this project.

Table 3-3
Percent of Conventional[1] Logging Methods Volume and Acres by Alternative

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Percent by volume	0	62%	62%	74%	31%	69%
Percent by acres	0	40%	41%	53%	17%	50%

[1] Includes cable and shovel yarding methods
Source: GIS

Limited Interstate Shipment Policy

The limited interstate shipment policy may improve economics for timber sales on the Tongass. The policy allows shipment to the lower 48 states of unprocessed Sitka spruce and western hemlock sawlogs smaller than 15 inches in diameter at the end of a 40-foot log, and grade 3 or 4 logs of any diameter. The policy also may increase the utilization of timber harvested. Sawmills in Southeast Alaska are challenged to generate a profit from the logs that will qualify for limited interstate shipment. Operators can choose which small-diameter and low-grade to ship to other states. Under the policy, timber sale purchasers are allowed to ship such material out of state. Shipments are limited on each sale to a maximum of 50 percent of total sawlog contract volume harvested of all species, including western redcedar and yellow-cedar, unless the Regional Forester grants an exception based on case-specific unusual circumstances. The policy enhances opportunities to get Tongass wood to manufacturing outlets.

Fuelwood Opportunities

Other potential markets that may improve economics for this project include bio fuels and firewood. The high cost of petroleum-based fuels may create a market for the biomass that is typically left in the woods following timber harvest. Logs that are currently low value as lumber may become more valuable as fuel to produce heat or energy. The community of Wrangell has seen an increase in firewood consumption. Permitted commercial firewood cutters are providing firewood to residents as a more-economical heating source. Firewood has even been shipped from Zarembo Island to Wrangell Island and sold commercially. There is potential for procuring commercial firewood from the Navy project area. Steve Seley, owner of Pacific Log and Lumber in Ketchikan, is offering to negotiate with Ketchikan City and Borough officials to finance a firewood production line at his mill. It is apparent that the fuelwood market in Southeast Alaska is emerging.

Selective Harvest Prescriptions

Another opportunity to improve economics may be contrary to popular belief, given the present increase in fuel costs. Helicopter mobilization and yarding costs could be offset by selectively harvesting a higher percentage of trees of higher value. The single-tree selection (STS) prescription would be implemented in helicopter harvest units and some shovel, or track-based harvest units. The STS prescriptions for the Navy project action alternatives would implement a 30 percent harvest, while removing less than 50 percent of Alaska yellow-cedar, western redcedar or Sitka spruce.

Forest Service Costs

Financial efficiency analysis compares estimated Forest Service direct expenditures with estimated financial revenues. Average financial costs used in the Alaska Region's budget allocation process are subtracted from indicated values to estimate net present value. The Forest Service costs used in the analysis are: $41/MBF for environmental analysis (NEPA), $23/MBF for sale preparation, $9/MBF for sale administration and $28/MBF for engineering support. These costs are based on Alaska Region's average budget allocation for cost centers.

Environmental analysis costs include field inventory, data analysis, public involvement, and preparation of documents that satisfy the requirements of the National Environmental Policy Act. Although the environmental analysis cost is based on timber volume, costs are related to the amount of area to be examined and the accessibility of that area.

Sale preparation costs include layout, cruising, appraisal and contract development. These costs increase significantly when implementing partial harvest units, as compared to clearcut harvest units. Accessibility to harvest units is another major cost factor. The Navy project harvest units will probably be more expensive to prepare due to location, accessibility and uneven-aged management prescriptions. Sale administration consists of administering the timber sale contract from award until sale completion. Normally, costs are associated with office documentation, timber sale accounting, and site visits to the sale area. Engineering support consists of planning new facilities and new roads. Engineers also have duties that include contract administration, and facilities and road maintenance.

Table 3-4
Estimated Forest Service Financial Costs and Revenues

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Forest Service Costs						
NEPA Analysis and Documentation1	$1,634,753	$1,634,753	$1,634,753	$1,634,753	$1,634,753	$1,634,753
Sale Preparation	0	$917,056	$1,756,291	$737,826	$763,547	$363,531
Sale Administration	0	$358,848	$687,244	$288,714	$298,779	$142,251
Engineering Support	0	$1,116,417	$2,138,093	$898,223	$929,536	$442,560
Total Project Costs	**$1,634,753**	**$4,027,074**	**$6,216,381**	**$3,559,516**	**$3,626,615**	**$2,583,095**
Indicated Bid Value2	$0	$(5,585,996)	$(12,409,638)	$(4,589,126)	$(5,322,028)	$(1,398,365)
Net Present Value	$(1,634,753)	$(9,613,070)	$(18,626,019)	$(8,148,642)	$(8,948,643)	$(3,981,460)

[1] Analysis and documentation costs are based on the proposed action (Alternative B)
2 Indicated Bid Value minus Total Project Costs; ( ) indicates negative value
Source: G. Roberts, NEAT_R version 2.15, 3rd Quarter 2007.

Projected Employment and Income

The action alternatives would have direct and indirect impacts to the economies of the local and regional communities. Indirect employment effects are not calculated in this analysis since indirect employment coefficients are applicable for large-scale analyses, such as regional or statewide assessments. They are not useful for local-scale analyses, such as individual timber sales.

In Southeast Alaska, sawmilling results in 3.31 annualized jobs per MMBF of net sawlog volume harvested on the Tongass. An annualized job is defined as the equivalent of one full-time job for 1 year, no matter how long the project takes. Each sawmilling job represents an average (2001-2005) of $31,690 per year. The income data comes from the Alaska Department of Labor (see previous reference) for sawmilling, a report included under wood product manufacturing. Sawmilling produces an average direct income of $115,250 per MMBF of net utilized sawlog volume, or $115 per MBF, for people employed in sawmilling.

Logging results in 2.31 annualized jobs per MMBF net sawlog volume harvested on the Tongass. This number is calculated from Tongass employment and net sawlog volume harvested from 2001 to 2005. Each job represents an average of $42,257 per year, according to Alaska Department of Labor statistics. Logging produces an average income of $95,983 per MMBF, or $96 per MBF volume sold. This data for forestry and logging includes road building.

Direct employment and income likely to result from timber harvest is estimated by converting board feet to jobs and income, using the sawmilling and logging coefficients above. Table 3-5 displays estimated direct logging and sawmilling-related employment and income, generated with NEAT_R v.2.15. Alternative A would not generate timber-related jobs since no timber would be cut.

The number of jobs and related income will likely fall somewhere between the high and low end of the range shown in this table, based on factors such as current timber markets and mill configuration.

Table 3-5
Estimated Project Employment and Income

Employment[1]	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
Logging	0	92	176	74	77	37
Sawmills	0	66-132	126-253	53-106	55-110	26-52
Total Jobs[2]	**0**	**158-224**	**303-429**	**127-180**	**131-187**	**63-89**
Income (million $)	0	$6.12-8.41	$11.72-16.11	$4.92-6.77	$5.10-7.00	$2.43-3.34

[1] Annualized job/years.
[2] Sawmill jobs range from 50 percent of net volume shipped outside Alaska to all sawlogs processed in Alaska.
Source: S. Alexander, Alaska Region Economist

Logging Systems and Costs

The action alternatives include the use of conventional cable and shovel yarding systems, and helicopter yarding. Table 3-6 displays the acres by yarding system for each alternative.

Conventional systems include cable and shovel yarding. Cable yarding systems are best suited for steep slopes and/or very wet soils and are most efficient using the clearcut harvest method. Shovel yarding (using track-mounted log loaders) is the least costly yarding method used in this analysis relative to the average-pond-log-value of harvested trees. Shovel yarding is best suited for slopes less than 30 percent. Normal yarding distance is less than 400-500 feet. Depending on slope and ground conditions, longer distances are possible. Shovel yarding does provide some flexibility in the

selection of trees to be harvested. This makes shovel yarding more suitable for partial-harvest prescriptions, including single-tree selection.

Helicopter yarding is the most expensive yarding method. With this system, logs are lifted from the ground and flown to a landing. Yarding distance, turn time (the time it takes the helicopter to make a round trip from landing to the unit and return), and the value of timber yarded influence the economic viability of helicopter yarding. Helicopter yarding is used where roads are not constructed to access the timber harvest units and works well for partial-harvest prescriptions.

Although individual 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 will help to increase future timber yields. The harvest of units with higher value can help compensate for less-economical harvest units.

The NEAT_R version 2.15 was used to evaluate the alternatives for the Navy project. The results are displayed in Table 3-4, above. The costs used in the NEAT_R model incorporate the same current costs used in the Alaska Region's appraisal program. Those costs reflect actual cost data collected from timber sale purchasers in Southeast Alaska, as well as production studies. The costs and values used reflect data updated for the 3rd Quarter of 2007 (June 5, 2008) and incorporate the limited shipment policy (Regional Forester 2400 memo, March 14, 2007). At times, certain situations and sales may have higher or lower costs than the regional averages, based on site-specific circumstances.

The harvest volumes, indicated value, costs, and net stumpage values used in this document are current estimates. They are useful for comparing the relative differences among alternatives and are not meant to reflect absolute values. Merchantable timber within units and any road right-of-way located on NFS lands will be cruised to determine the quantity, quality, and value of timber for the contract under which that volume of timber is offered. The final sale appraisal will include current quarter selling values, current cost information, and a normal profit and risk allowance to determine the minimum advertised stumpage value at the time of offering. Under current Congressional direction (Public Law 110-161, House Report 110-497) no timber sale in the Alaska Region shall be advertised if the indicated rate is deficit. Sales with volumes under 250 MBF do not require an appraisal and can be advertised using established standard rates.

Direct and Indirect Effects

Economic effects are analyzed in the 1997 Forest Plan Final EIS, 2003 Forest Plan SEIS, and most recently in the analysis for the 2008 Forest Plan Final EIS. Alternatives B through F would contribute to the timber–related economy of Southeast Alaska, with Alternative C having the greatest effect in terms of jobs supported, revenue generated, and amount of volume contributing to supply and Alternative F having the least effect of the action alternatives. Under Alternative A, no timber would be harvested from the project area at this time, and timber from other areas on the Tongass would have to be harvested to provide a supply.

Alternative A

No timber volume would be offered for sale under this alternative, no contribution would be made to the local or regional Southeast Alaska economy, and there would be no support of local or regional timber-related employment. There would be no contribution to the timber supply for mills to operate and meet market demand. No additional land in the Tongass timber base would be actively managed or attain the

desired silvicultural condition. No infrastructure would be built that could enhance multiple use opportunities within the project area.

Alternative B

This alternative would produce the second-highest amount of volume (45,531 MBF) and economic activity. NEAT_R computed road costs at $72/MBF and logging costs at $459/MBF. The indicated bid value falls in the middle by alternative rating at ($5,585,996), or an advertised rate of ($142.00)/MBF.

Alternative C

This alternative would produce the most volume at 87,499 MBF. This alternative offers the most support for timber-related jobs. A new marine access facility (Mosman Inlet) and road system would be developed. NEAT_R computed road costs at $90/MBF, with an estimated cost of $50,000 for a marine access facility. Logging costs are the highest at $483/MBF. The indicated bid value is the furthest deficit at ($12,409,638), or an advertised rate of ($163.65)/MBF.

Alternative D

This alternative proposes to harvest 37,189 MBF and generates the second-lowest economic activity. NEAT_R computed road costs at $85/MBF. Logging costs are $451/MBF. This alternative has the second-least negative bid value at ($4,589,126), or an advertised rate of ($143.06)/MBF.

Alternative E

This alternative would produce 38,358 MBF and would generate economic activity in the middle of the alternative range. NEAT_R computed the second-lowest road cost by alternative at $56/MBF. This alternative has the second-highest logging cost at $479/MBF. The indicated bid value for this alternative is ($5,322,028), or an advertised rate of ($160.31)/MBF.

Alternative F

NEAT_R computed the lowest road costs by alternative at $33/MBF. No harvest would occur from inventoried roadless areas. The volume harvested and economic activity generated for this alternative is the lowest of all action alternatives, approximately 20 percent of Alternative C. This alternative would produce 18,287 MBF. Logging costs are the lowest at $400/MBF. The indicated bid rate is the least negative of all alternatives at ($1,398,365), or an advertised rate of ($88.47)/MBF.

Table 3-6
Comparison of Alternatives – Harvest System, Volume, and Roads

	Unit of Measure	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Harvest System							
Conventional	Acres	0	1,273	2,505	1,247	554	626
	MMBF (net	0	24.3	46.6	23.7	10.3	10.9
Helicopter	Acres	0	1,939	3,602	1,122	2,772	625
	MMBF (net	0	15.0	29.1	8.3	22.8	4.8
Harvest Volume							
Net Sawlog	MMBF	0	39.3	75.8	32.1	33.2	15.8
Utility	MMBF	0	6.2	11.7	5.1	5.2	2.5
Total [1]		**0**	**45.5**	**87.5**	**37.2**	**38.4**	**18.3**
Roads							
New NFS	Miles	0	6.6	12.1	4.8	2.2	0.5
Temporary	Miles	0	5.7	14.2	4.8	2.3	3.2
Reconstruction	Miles	0	0.9	2.9	0.4	2.2	2.2
New LTF	#	0	0	1	0	0	0

[1] Includes cable, shovel, and helicopter yarding systems
Source: GIS and NEAT_R version 2.15, 3rd Quarter 2007

Cumulative Effects

Past, Present, and Reasonably Foreseeable Future Timber Harvest in the Project Area (or Etolin Island)

The past timber sale projects have developed some infrastructure on Etolin Island, including the Anita Bay marine access facilities. Most of the past harvest in the Navy project area occurred between 1983 and 1999. The Starfish Timber Sale was offered in 1992 to the Ketchikan Pulp Company under their long-term contract. Granite, Quiet, Etolin, Camp Mossy and other small sales were prepared under the Wrangell Ranger District Independent Timber Sale Program. Clearcut logging occurred in various locations along the shoreline prior to development of the road system. Hand logging of individual trees has also occurred in the beach buffer.

Timber sale planning has been completed for three salvage projects on Etolin Island: Porcupine Salvage, Fishtrap Salvage and North Etolin Salvage. The Porcupine Salvage project, which sold in January 2009, is a salvage harvest of approximately 766 MBF of blowdown sawtimber and utility volume from one area near Kindergarten Bay and another area east of upper Mosman Inlet. The two Porcupine Salvage areas total 26 acres. The Fishtrap Salvage project was sold in 2007 and will harvest 208 MBF of cedar decline and blowdown volume from 240 acres adjacent to the existing 51540 road, which parallels Fishtrap Creek. The North Etolin Salvage is located on the Honeymoon Creek road system, Road 6549, outside the Navy project area. This salvage would cover about 4 miles of roadside and would harvest primarily dead and nearly dead red and yellow cedar.

These small salvage projects would contribute little to overall Tongass timber program but provide opportunities for the small operators. Future small sales could be planned

along the proposed NFS roads if constructed for the Navy project, although the operator would need to reopen any roads that were put into storage.

A project proposal for the Wrangell District Roadside Timber Sales was added to the SOPA in January 2009 and scoping has begun. This project is designed for multiple small timber and fuelwood sales and microsales. It would harvest up to 5 MMBF of salvage and green timber along the existing road systems on Wrangell, Zarembo, and Etolin Islands over multiple years and help contribute to the Tongass timber program in conjunction with this project.

As stated in the Opportunities to Improve Economics section, the emerging fuelwood market could enhance the economics of a timber sale in the project area, or could provide a stand-alone economic opportunity for a commercial firewood venture. A vibrant fuelwood market would likely increase utilization of material, which contributes to supply.

The Forest Plan Amendment FEIS, Volume 1, Chapter 3 and Appendix G discuss the Tongass timber program in more detail. All past harvest and Navy Timber Sale was considered in that analysis.

The Alternative Comparison section shows that Alternative C would have the greatest effect in terms of jobs created, revenue generated, and amount of volume contributing to supply and Alternative F would have the least effect of the action alternatives. Alternative A, the No-action Alternative, would have not help support the Tongass timber program and timber from other areas would need to be used to help meet the demand.

Issue 2: Wildlife Habitat Fragmentation

The extent to which activities will fragment wildlife old-growth forest habitat and/or affect connectivity.

Concerns were expressed about the effects of fragmentation on wildlife habitat and wildlife populations by removing old-growth habitat and/or connectivity.

Measurements:

- Acres of productive old-growth (POG) habitat maintained in wildlife analysis area (WAA) 1901 after harvest by alternative
- Acres and the size of the individual blocks of interior POG maintained in WAA 1901 after harvest by alternative
- Acres of coarse canopy (SD67) old growth maintained in WAA 1901 after harvest by alternative

Introduction

Many wildlife species prefer or have their highest densities in productive old-growth forest (POG). Some species prefer larger patches. The hairy woodpecker, a management indicator species, prefers patches at least 500 acres in size (USDA 2008 Forest Plan Amendment Final EIS page 3-240). Large patches are more likely to have interior old-growth conditions, which are preferred by some species such as brown creepers. As old-growth habitat is fragmented, large patches become smaller, are less likely to have interior characteristics and often become isolated from one another. Decreases in large patches of POG can reduce the preferred habitat for these and other species, and can lead to reduced populations and genetic isolation. Both natural fragmentation and previous harvest have reduced the effectiveness of the beach buffer as a corridor between OGRs. This analysis focuses on how much POG habitat is left, particularly those portions of POG considered interior forest or coarse-canopy forest, and POG corridors connecting large blocks of POG.

Analysis Area

The analysis area for total, interior, and coarse-canopy POG is WAA 1901. WAA 1901 was selected for this analysis and for the wildlife analysis area in order to help associate the wildlife effects to the amount, size and distribution of habitat. The entire Etolin Island is also analyzed for number and quality of landscape-level productive old-growth (POG) corridors to demonstrate level of compliance with the Forest Plan requirement to provide at least one POG corridor between medium and large old-growth reserves and other non-development LUDs.

Summary of Effects

All action alternatives' even-aged and two-aged prescriptions have some impact on old-growth habitat, with Alternatives B and C having the greatest impacts. The proposed single-tree selection helicopter harvest with 70 percent retention, while having some impact, should still leave sufficient structure to maintain old-growth characteristics.

All alternatives would harvest the lower part of Unit 37, which would result in a break in the corridor on the east side of Mosman Inlet leading to the South Mosman SOGR. All alternatives except Alternative E propose harvest in the Anita Bay pinch point (see

Figure 3-6), affecting this already fragmented area. All alternatives except Alternative E would harvest Unit 67, which would eliminate the lower-elevation, relatively broad corridor between the south shore of Anita Bay and the east side of Burnett Inlet. Only a narrow, higher-elevation corridor would remain.

Most of the alternatives did not appreciably reduce the size of the larger blocks of interior POG since most of the harvest was in smaller POG blocks or was partial harvest with at least 70 percent retention.

Other management activities in old-growth habitat that are planned in the WAA are not expected to have cumulative impacts.

Affected Environment

Old-growth Reserves

An integrated old-growth conservation strategy was developed during the 1997 Forest Plan revision. One component of this strategy is a network of small, medium, and large Old-growth Habitat Reserves (OGRs). None of the small OGRs and the Steamer medium OGR on Etolin Island as designed by the 1997 Forest Plan met all of the criteria for OGRs in that Plan's Appendix K. The Navy DEIS identified this as an issue and proposed changes to the small OGRs. During the analysis for the 2008 Forest Plan, that was concurrent with the analysis for the Navy Timber Sale project, all the small OGRs across the Tongass were reviewed and adjustments were included with the 2008 decision. These designs are now incorporated in all alternatives in the Navy FEIS.

Changes to the Steamer medium OGR were discussed in response to a public comment on the Navy DEIS. This OGR does not have as much high-volume strata POG as intended for a medium OGR (1,400 acres v. 2,500 acres) since this area in general has less high volume strata POG than some other areas on the Tongass. However, the location was considered more important when considering the spatial arrangement with relation to other medium and large OGRs. The old-growth strategy as a whole was reviewed during the analysis for the Forest Plan Amendment (see Forest Plan Amendment FEIS, Appendix D).

Productive Old-growth (POG) Habitat

Productive old-growth forest (POG) is defined as stands at least 150 years old, capable of producing at least 20 cubic board feet/acre/year and currently having at least 8,000 board feet/acre. The POG forest on Etolin Island is naturally fragmented. Muskegs, scrub-shrub wetlands, riparian areas, non-productive forested wetlands, alpine areas, and island topography all contribute to the naturally fragmented distribution of POG on Etolin Island, including WAA 1901.

Prior to any timber harvest, there were roughly 66,000 acres of POG in WAA 1901. Currently there are roughly 60,600 acres (92 percent) remaining. In addition to total POG acres, the size of the blocks of POG is also important, with large blocks more likely to contain more interior old-growth habitat. There are currently five large blocks in excess of 5,000 acres, averaging 13,200 acres each and four blocks between 1,000-5,000 acres averaging 2,350 acres each (Figures 3-1 and 3-2).

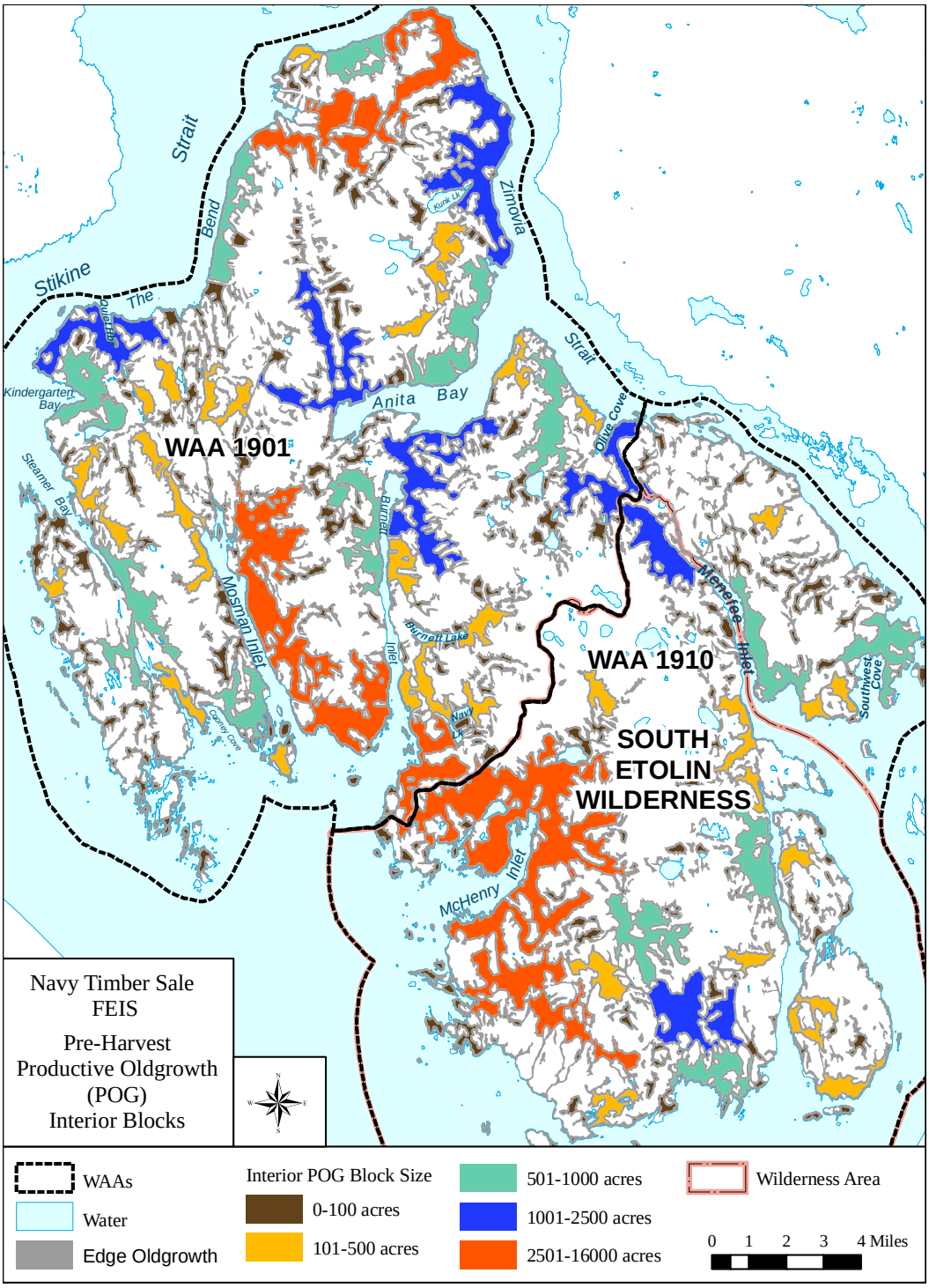
Interior Old Growth

Interior POG is defined as old-growth habitat at least two average tree heights from the edge of the block. This distance varies from 100-600 feet across the Tongass (2008 Forest Plan Amendment Final EIS, pg 3-168). The interior-edge analysis in the 2008

Forest Plan Final EIS uses a buffer of 300 feet (2008 Forest Plan Final EIS, Appendix D, pg. D-14), and that distance is used in this analysis. Interior old growth tends to have different characteristics than the forest at the edge of a block, due to light interception by surrounding trees, buffering from the effects of wind, and the general absence of transitional plant species. Interior old growth provides wildlife with habitats protected from predator or competitor species that primarily use openings and the adjacent edges of forested areas. Interior forest habitat is already limited in the effects area, and large, contiguous blocks of interior forest habitat are uncommon, given the natural fragmentation and the additional fragmentation caused by past harvest. Timber harvest reduces interior old growth both by direct harvest and indirectly by increasing the edge effect. Figure 3-2 depicts the spatial distribution of existing interior old growth across the WAA. Past timber harvest has reduced interior old-growth habitat by 18 percent, from roughly 30,100 acres to 24,650 acres.

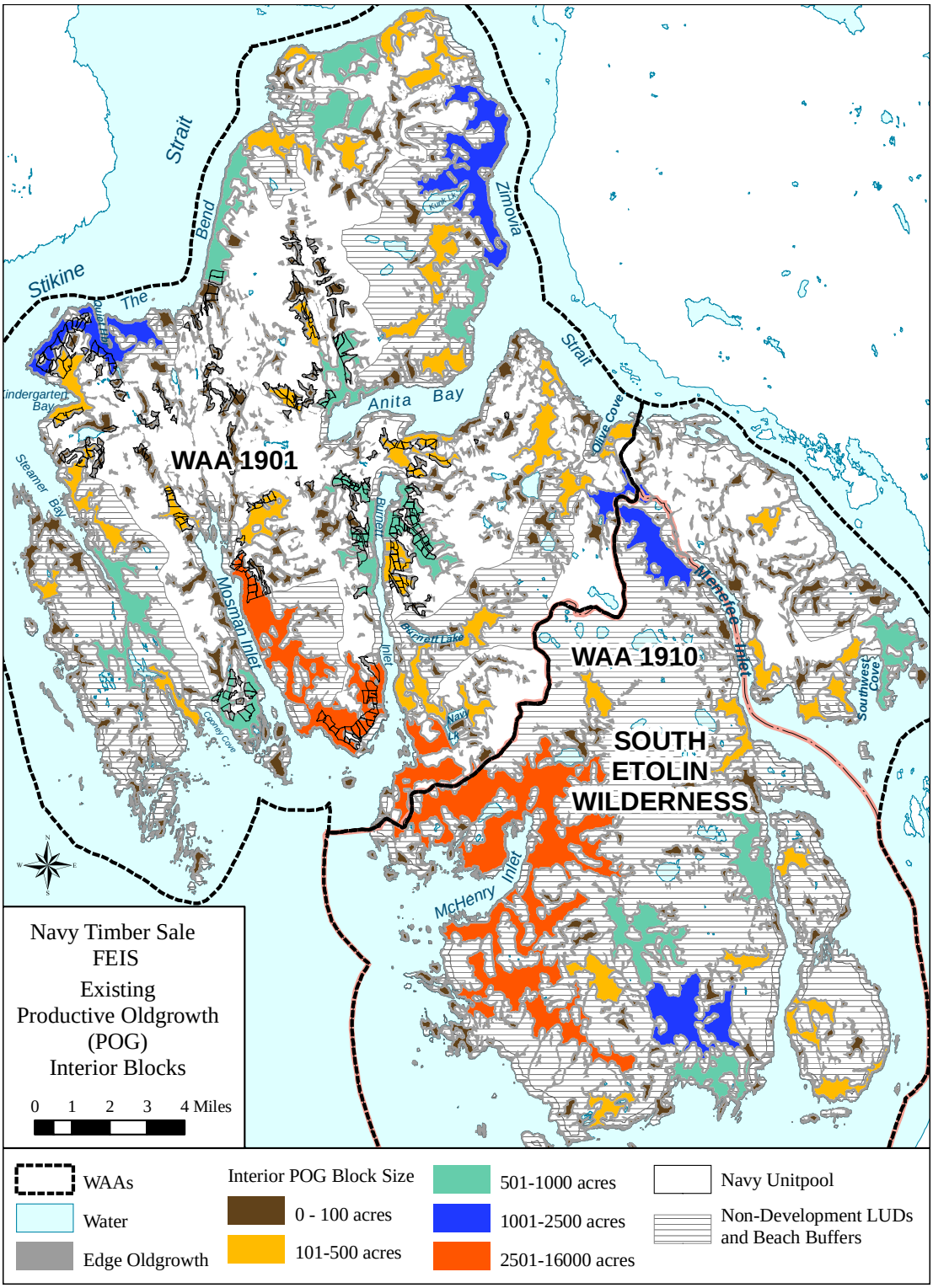
The area between Mosman and Burnett Inlets, the area from Kindergarten Bay to Quiet Harbor and The Bend, the area near Kunk Lake, and the Navy Creek watershed, including the connected interior old growth in the South Etolin Wilderness, contain some of the larger blocks of interior habitat present in WAA 1901, at 2,800, 1,100, 2,000, and 8,500 acres, respectively. Other fairly large (500-1000 acre) blocks of interior old growth are located in the Cooney Cove area, in lower Fishtrap Creek, Steamer Bay, in the Detailer Creek watershed on the northeast side of Burnett Inlet and on the northwest shore of Burnett Inlet. The pre-harvest blocks of interior old growth are shown in Figure 3-1. The existing blocks of interior old growth are shown in relation to the proposed Navy harvest units and to areas protected from harvest by the Forest Plan in Figure 3-2.

Figure 3-1
Pre-harvest Productive Old-growth Interior Blocks on Etolin Island



Source: J\fsfiles\office\gis\navy\plots\feis_plots9_2\wildlife_maps\pognohar_intedge_blocks

Figure 3-2
Existing Productive Old Growth and Interior Habitat in WAA 1901

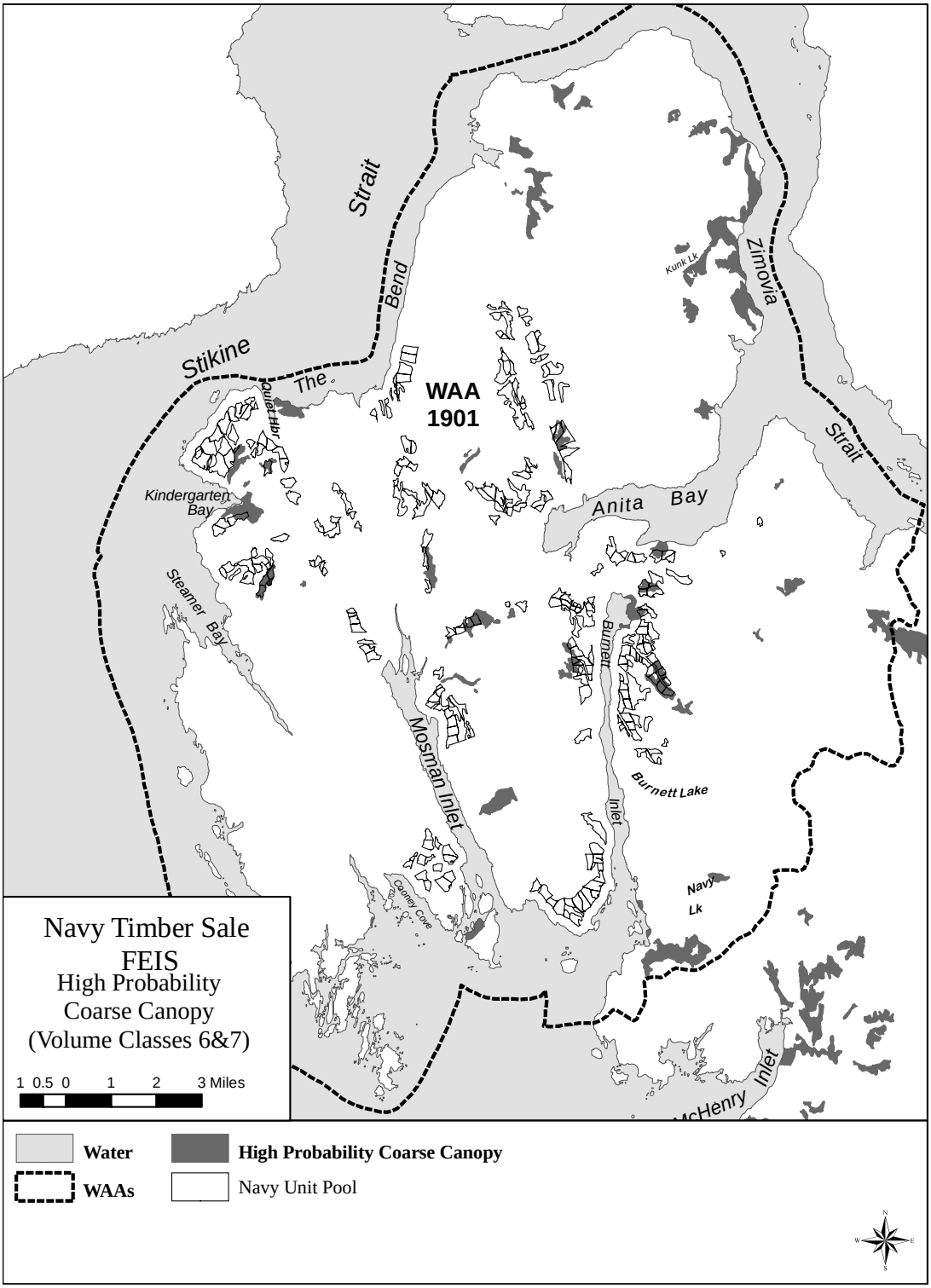


Source:
J:\fsfiles\office\gis\navy\plots\feis_plots9_2\wildlife_maps\pogex_intedge_blocks.mxd

Coarse Canopy/Large-Tree-High-Volume POG

Previous direction (Cole, 2005) used in the Navy Draft EIS called for analysis of the impact of timber harvest on coarse canopy POG, defined as volume class 6 and 7. The 2008 Forest Plan Amendment Final EIS uses a size-density model to categorize forested stands. The size-density model (SDM) uses a combination of two forest measurements: tree sizes and tree densities. This has proven to be the best tool for representing forest elements such as structural diversity. SDM uses timber volume class, hydric soil class and aspect to characterize forest structure. Coarse-canopy POG is now defined by the SDM class of SD67 and is referred to as large-tree POG. Table 3-7 displays the acreage and Figure 3-3 displays the location of high-probability coarse-canopy stands remaining in WAA 1901. Of the estimated original 4,485 acres of coarse-canopy forest in WAA 1901, 3,654 acres (81 percent) remain. Of these remaining acres, 2,258 acres (62 percent of the existing acres, 51 percent of the original acres) are protected by non-development LUDs, beach and estuary buffers, riparian management areas, and other areas not suitable for timber harvest.

Figure 3-3
Existing High-probability Coarse-canopy Habitat in WAA 1901 and Adjacent Area



Source: J:\fsfiles\office\gis\navy\plots\feis_plots9_2\wildlife_maps\coarse_canopy.mxd

POG Corridors

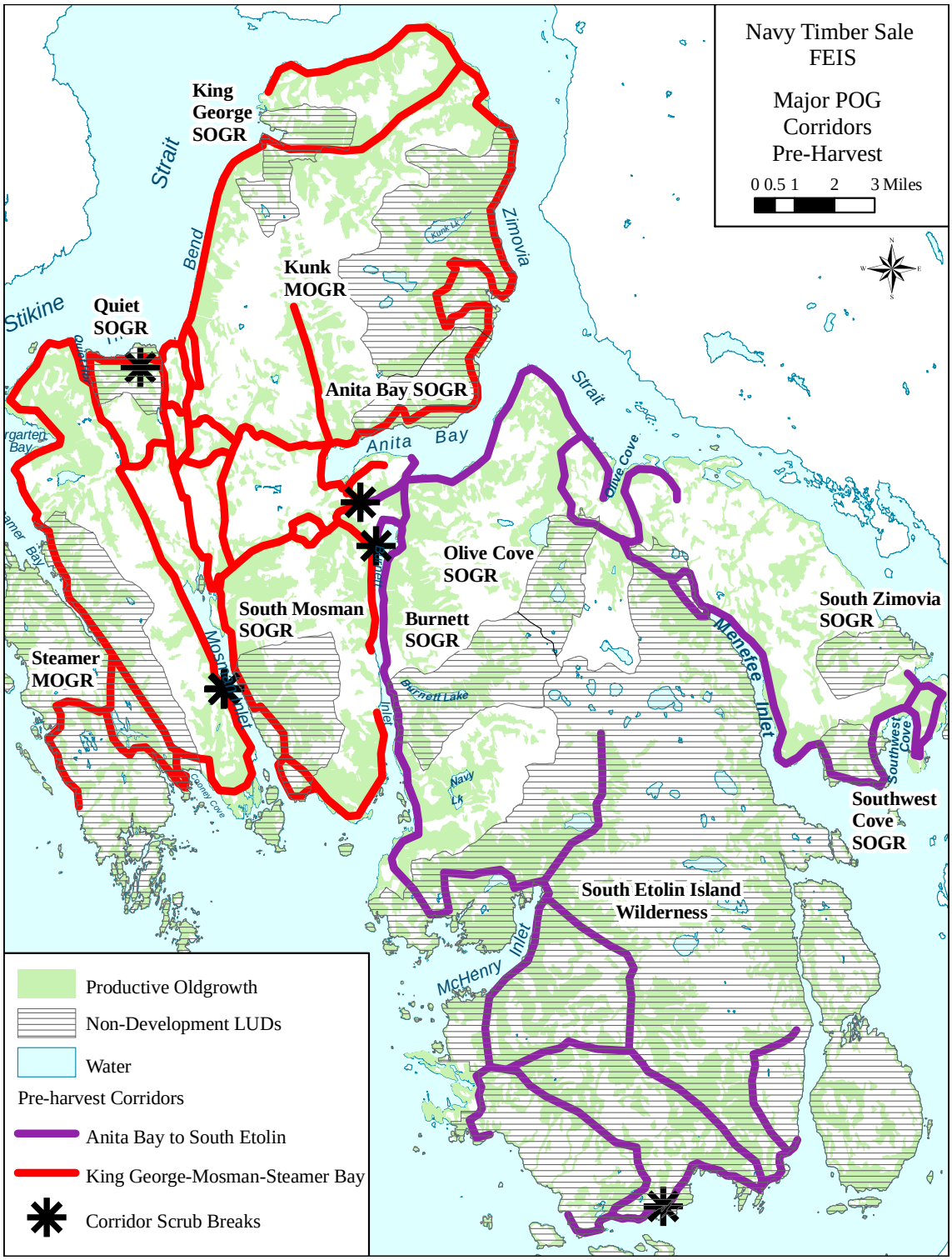
Landscape-level POG corridors are important for dispersal between large blocks of old growth for wildlife species, which are associated with or prefer POG habitat, thus maintaining biodiversity. Maintenance of connectivity between OGRs is important to minimize the isolation and decline of wildlife species associated with these reserves (Harris 1984), and may be equally as important as maintaining the reserves themselves. In the absence of adequate connectivity, movement of wildlife between suitable habitats may be restricted, which can lead to increases in the susceptibility of wildlife populations to local extinctions and reductions in species diversity. Some species avoid or have difficulty crossing openings (both natural and man made) or are more vulnerable to predation in open habitats (2008 Forest Plan Amendment Final EIS pg. 3-234 and 3-244; Smith 2007).

Forest Plan Standards and Guidelines for landscape connectivity directs that at least one POG corridor connects large old-growth blocks in medium and large OGRs and other non-development LUDs and that these corridors should be wide enough to minimize edge effects (USDA 2008, Forest Plan, pg. 4-91). Small OGRs (SOGRs), beach buffers, and riparian corridors should provide most of this landscape connectivity. The Forest Plan directs that where these latter areas are insufficient to provide these POG corridors, where they exist, stands in the matrix outside of these protected areas will be designated for this purpose. While it is not required by the Forest Plan to provide POG corridors between old-growth blocks not in medium and large OGRs, these corridors are still highly desirable. Even prior to any timber harvest, the POG habitat was so naturally fragmented on Etolin Island that there were very few wide POG corridors; most were narrow and lacked interior old-growth conditions. Many of these narrow POG corridors are adjacent to dense scrub forest (non-productive old-growth forest) which helps POG connectivity and lessens the effect to the interior habitat.

POG corridors on Etolin Island were delineated using GIS vegetation layers, with confirmation in some areas using aerial photos. Prior to any timber harvest on Etolin Island, there were two major, contiguous POG corridor “systems”, as illustrated in Figure 3-4, each system shown in a different color. Within each system, there are no breaks in POG habitat. In many areas, these corridor systems were only separated from each other by fairly narrow (250-500 feet wide) stands of dense scrub forest, so they may not actually have been separate corridor systems for many wildlife species. Sign of large mammals such as deer, bears and wolves using this scrub forest during periods of no or low snow have been observed by field personnel. It is not known to what extent small mammals use this habitat and hence to what extent this scrub forest is a barrier to their movements.

As can be seen in Figure 3-4, even prior to timber harvest, Kunk and Steamer MOGRs were connected to each other, but were separated from the South Etolin Island Wilderness by the small sections of scrub forest mentioned previously. If these small sections of scrub forest are not considered breaks in the corridors, these three areas were connected by at least one corridor prior to any timber harvest.

Figure 3-4
Pre-harvest Landscape-level POG Corridors on Etolin Island



Source: J:\fsfiles\office\gis\navy\plots\feis_plots9_2\wildlife_maps\corridors_nohar8x11.mxd

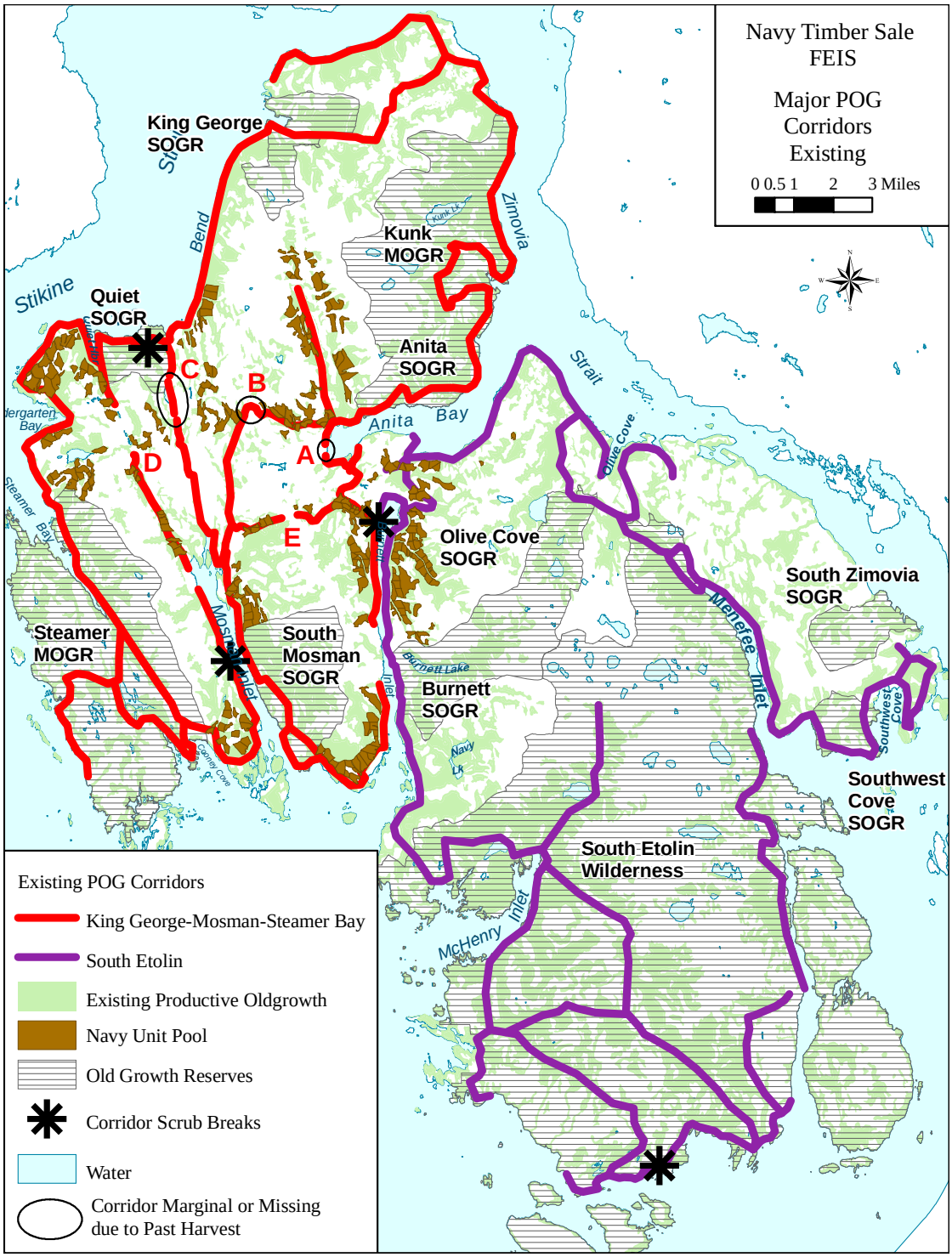
Past timber harvest has fragmented these corridors, and the remaining sections are may not function as an old-growth corridor for some species because they are narrow in several locations (Figure 3-5). The multiple POG corridors, which connected the Kunk and Steamer MOGRs prior to timber harvest, are now broken up by young-growth stands. If the small sections of scrub forest mentioned above continue to function as corridors, the Kunk and Steamer MOGRs and Anita, South Mosman and King George SOGRs are still connected by at least one corridor. Scrub forest, although considered as non-productive forest, is sometimes dense with large trees. The South Etolin Wilderness and adjacent Burnett and Olive SOGRs are now separated by young-growth forest from these other OGRs.

The north-south corridor along the beach at the head of Anita Bay (‘A’ in Figure 3-5) should be the quickest to recover, since the single young-growth stand here is already 44 years old and is now protected by Beach Buffer Standards and Guidelines. This stand was pre-commercially thinned in 1985. This is probably the only POG corridor that will ever reconnect the Kunk and Steamer MOGRs to the South Etolin Wilderness because of natural fragmentation.

The corridor along the east edge of the Quiet SOGR (‘C’ in Figure 3-5) will likely take 100-150 years to recover as it is fragmented by fairly young harvest units, although most of this harvested area is now protected by riparian buffers. When this corridor recovers, it will connect the Kunk, King George and Anita OGRs to the South Mosman SOGR, but not to the Steamer MOGR or the South Etolin Wilderness.

Corridor ‘B’, passing between ‘C’ and ‘A’, has been affected by past timber harvest, especially in the “bend” area circled in Figure 3-6. The corridors that used to extend south from Quiet Harbor to Mosman Inlet (‘D’), and between the heads of Mosman and Burnett Inlets (‘E’), are disconnected by past harvest and may be harvested in the future. Future conncetions may not occur until the trees mature.

Figure 3-5
Existing Landscape-level POG Corridors on Etolin Island

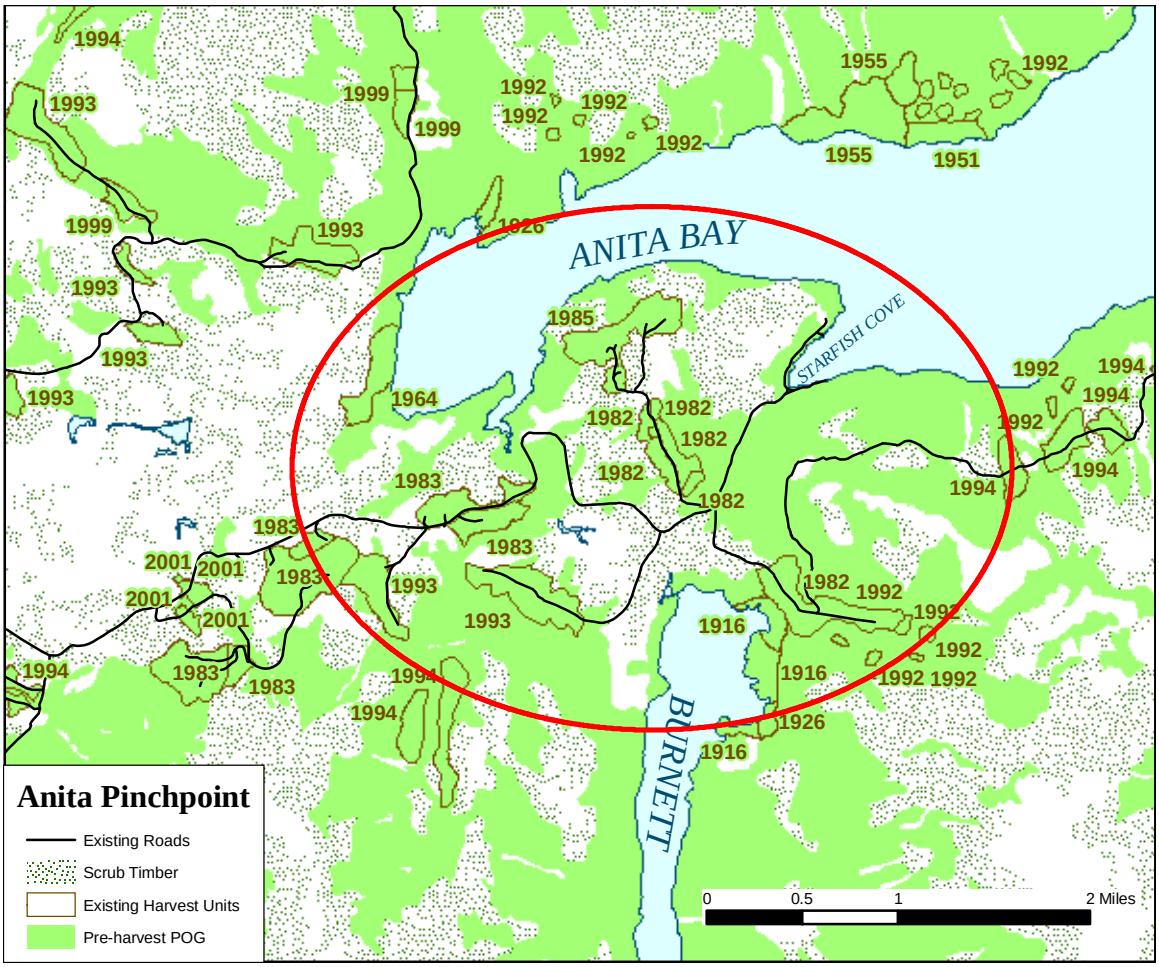


None of the proposed units in the Navy unit pool would harvest within the beach buffer.
Source: J:\fsfiles\office\gis\navy\plots\feis_plots9_2\wildlife_maps\corridors_existing_unitpool8x11.

Anita Pinch Point

Related to POG corridors is wildlife movement across the narrow neck of land between the heads of Anita Bay and Burnett Inlet, referred to as the Anita pinch point (Figure 3-6). A "pinch-point" is a relatively narrow corridor of habitat between saltwater areas and may constrain wildlife movements and genetic interchange for other plants and animals. The pinch point is approximately 1.1 miles across at its narrowest point. There are approximately 97,000 acres north of the pinch point and 117,000 acres south of the pinch point on Etolin Island. Prior to any harvest activities, landscape connectivity was marginal due to the POG being broken up by stands of scrub forest and muskegs. Past timber harvest, road building, and LTF construction have further affected connectivity through this area.

Figure 3-6
Anita Pinch Point Area



Source:
J:\fsfiles\office\gis\navy\plots\feis_plots9_2\wildlife_maps\AnitaPinchPtPreHarv.mxd

Environmental Consequences

Direct and Indirect Effects

Table 3-7 summarizes the amount of POG, interior POG, and coarse canopy remaining after harvest (excluding partial harvest prescriptions) by alternative. For purposes of this analysis, it is assumed that the proposed single-tree selection helicopter harvest with 70 percent retention, while having some impact, should still leave sufficient forest structure to function as old-growth (Deal and Tappeiner, 2002), and therefore were not counted in these calculations. However, the partial-harvested stands will no longer be considered coarse canopy.

All action alternatives have some impact on old-growth habitat, with Alternatives B and C having the greatest impacts. This impact is inevitable since a large portion of the Navy project area and WAA 1901 (the old-growth analysis area) is composed of development LUDs and any timber harvest is going to involve old growth since there is no second-growth timber available for harvest in these areas. One of the potentially avoidable impacts of any of the action alternatives is to the remaining landscape-level POG corridors as well as old-growth connectivity in the Anita pinch point. All alternatives propose harvest of Units 115-117, which would significantly compromise the one remaining north-south corridor (‘B’ on Figure 3-5). All alternatives would harvest the lower part of Unit 37, which would result in a break in the corridor on the east side of Mosman Inlet leading to the South Mosman SOGR. While the Forest Plan does not require corridors connecting to SOGRS, this is still a desirable feature. All alternatives except E propose harvest in the Anita pinch point, increasing the fragmentation in this area that is naturally fragmented and has received past harvest. All alternatives except E would harvest Unit 67 which would remove the lower elevation, relatively broad part of the corridor between the south shore of Anita Bay and the east side of Burnett Inlet, leaving only a narrow, higher-elevation corridor.

The action alternatives also vary in their effects to coarse-canopy POG, interior POG. Most of the alternatives did not significantly reduce the size of the larger blocks of interior POG, since most of the harvest was in smaller POG blocks or was partial harvest with at least 70 percent retention.

Table 3-7
POG Habitats Affected by Clearcut Harvest, by Alternative for WAA 1901

	Acres Remaining (Percent reduction from Existing)[1]						
	1900	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
POG	66,219	60,750	59,169 (2.6 %)	57,689 (5.0 %)	59,263 (2.4 %)	59,889 (1.4 %)	59,906 (1.4 %)
Interior POG[2]	30,096	24,642	23,051 (6.5%)	22,013 (10.7%)	23,280 (5.5%)	23,702 (3.8%)	24,044 (2.4%)
Coarse Canopy [3, 4]	4,485	3,654	3,286 (10.1%)	3,255 (10.9%)	3,341 (8.7%)	3,421 (6.4%)	3,583 (1.9%)

[1] For POG, harvest prescriptions other than STS, except for STS in volstrata low, this will become non-POG. This analysis assumes that structure retained in partial harvest prescriptions will be sufficient to retain old-growth characteristics (Deal 2001).
[2] Interior POG is reduced by both direct harvest and edge effects.
[3] Defined as volume classes 6 and 7; same as size density model SD67; includes some past partial harvest.
[4] All harvest subtracted from coarse canopy since 30% partial harvest drops the volume class to 5.
Source: J:\fsfiles\office\gis\navy\wild\wild83.mdb, interactive GIS queries.

Alternative A (No Action)

Alternative A is the only alternative that proposes no harvest of coarse-canopy stands or interior forest and no further compromise of landscape-level POG corridors. Since these are limited resources, this is the only alternative to maintain these habitats in their current condition.

Alternative B

Alternative B has intermediate impacts to interior forest, similar to Alternative D, and the second-highest impacts to coarse-canopy forest, close to Alternative C. This alternative proposes the harvest of most of the remaining suitable POG in the Anita pinch point, the same as Alternatives C and D, impacting of the old-growth connectivity in this area. Unit 67 would result in a break in the lower-elevation POG corridor connecting the south shore of Anita Bay with the east shore of Burnett Inlet, and other POG to the east and south, leaving only a narrow, higher-elevation POG corridor connecting these areas.

Alternative C

Alternative C proposes the most coarse canopy harvest and the greatest reduction of interior habitat. This alternative poses the greatest risk to species dependent on these habitat types. This is the only alternative that proposes harvest in the Cooney Cove area. The proposed harvest of Units 109-113 would create a 2-mile long break in elevational corridors of the Kindergarten-Quiet Harbor block. This contiguous, 317-acre harvest area (0-15 percent retention) would result in a large reduction in total and interior POG in this block.

This alternative proposes the same harvest in the Anita pinch point as Alternatives B and D, significantly impacting what remains of old-growth connectivity in this area. Unit 67 would result in a break in the low-elevation corridor connecting the south shore of Anita Bay with the east shore of Burnett Inlet, and other POG to the east and south, leaving only a narrow, high-elevation POG corridor connecting these areas.

Alternative D

This alternative has intermediate impacts to interior habitat, similar to Alternative B and reductions in coarse-canopy forest close to Alternatives B and C. This alternative proposes the same harvest in the Anita pinch point as Alternatives B and C, significantly impacting what remains of old-growth connectivity in this area. Unit 67 would result in a break in the low-elevation corridor connecting the south shore of Anita Bay with the east shore of Burnett Inlet, and other POG to the east and south, leaving only a narrow, high-elevation POG corridor connecting these areas.

Alternative E

Alternative E is similar to Alternative F in the amount of interior POG that is harvested and is intermediate in harvest of coarse canopy between Alternatives D and F. This is the only alternative that does not propose any harvest in the Anita pinch point, maintaining what little connectivity remains in this area, especially the broad, low-elevation corridor between Anita Bay and Burnett Inlet.

Alternative F

Alternative F proposes the least amount of harvest of all of the action alternatives for both interior and coarse canopy and, therefore, the least effect on large patches of old-growth habitat (and the species associated with large patches of old-growth habitat). This alternative has less harvest in the Anita pinch point than Alternatives B, C and D. The prescription for Unit 67 for this alternative proposes 50 percent retention of this unit to maintain part of the low-elevation POG corridor, which would be severed completely with Alternatives B, C, and D.

Cumulative Effects

The only other management activities that are planned in the WAA that would affect old-growth habitat are three small salvage sales of mostly blowdown and standing dead timber that are not expected to have a significant impact. Previously harvested areas that are now protected by Forest Plan non-development LUDs and Standards and Guidelines will gradually regain their old-growth characteristics, decreasing fragmentation and increasing block size in some areas and restoring compromised landscape-level POG corridors.

A project proposal for the Wrangell District Roadside Timber Sales was added to the SOPA in January 2009 and scoping has begun. This project is designed for multiple small timber and fuelwood sales and microsales. It would harvest up to 5 MMBF of salvage and green timber along the existing road systems on Wrangell, Zarembo, and Etolin Islands over multiple years. This project may have some effects to the old-growth habitat along existing roads but the extent of the effects is not known at this time.

About 94 percent of the POG present on Etolin Island (92 percent in WAA 1901) prior to timber harvest is still intact and has not been harvested. Under the 2008 Forest Plan, approximately 66 percent of POG that originally existed on Etolin Island (51 percent in WAA 1901) is largely unavailable for timber harvest and development, through protection in beach buffers, riparian management areas (RMAs), and non-development LUDs.

Issue 3: Inventoried Roadless Areas

The extent to which timber harvest and road construction in inventoried roadless areas could affect the characteristics of those areas.

Concerns were expressed that timber harvest and road construction in inventoried roadless areas could affect the characteristics of the area.

Introduction

An inventoried roadless area is an undeveloped area typically exceeding 5,000 acres that meets the minimum criteria for wilderness consideration under the Wilderness Act. Inventoried roadless areas are discussed in detail in the 2003 Forest Plan SEIS (USDA 2003).

Nationally, roadless areas have important values and characteristics that are becoming increasingly scarce as lands are developed. Roadless areas provide places to recreate away from roads and developments, undisturbed landscapes, habitat for plants, birds, fish, and other wildlife, and opportunities to study natural ecosystems.

Measurements:

- Acres of inventoried roadless areas affected by timber harvest and road construction
- Miles of road proposed in inventoried roadless areas

To determine changes in the roadless character by alternative, existing and proposed roads were buffered by 1,200 feet, and cable unit boundaries were buffered by 600 feet. This buffer area is called a zone of influence. It is assumed that effects do not stop at the roadless area boundary, but do taper off within this zone of influence. The effects to roadless areas were measured by the miles of new proposed road, and the amount of acres affected by harvest of cable units (including the area within the zone of influence). Helicopter units did not receive a buffer.

Units harvested by helicopter yarding are not included in the acres of roadless character changed because these units leave 70 percent of the timber stand intact and do not require any road building. Helicopter yarding does not cause the same disturbance to roadless character as cable harvest units that are clearcut and accessed by roads because the ground disturbed is less, and the duration of noise is less. The acres of helicopter yarding are found in Table 3-6, and any environmental effects are covered in the other issue and resource sections of Chapter 3.

Additional characteristics used to analyze the effects to roadless areas include:

- soil, water, and air;
- sources of public drinking water;
- diversity of plant and animal communities;
- habitat for threatened, endangered, proposed, candidate, and sensitive species;
- primitive, semi-primitive non-motorized, and semi-primitive motorized classes of recreation opportunities;

- surrounding landscapes;
- landscape character, and scenic integrity; traditional cultural properties and sacred sites; and locally identified unique characteristics.

Since the roadless areas are within the analysis area for all resources, the effects to the characteristics listed above are described in detail in each resource report, and in Chapter 3 of the EIS under each resource section. A summary of important aspects of these effects follows the Affected Environment discussion.

Status of the 2001 Roadless Area Conservation Rule

In August 2008, the Federal District Court for the District of Wyoming again held that the 2001 Roadless Area Conservation Rule was unlawfully promulgated in violation of the National Environmental Policy Act and the Wilderness Act. The Wyoming court rejected the Forest Service's request for narrowly tailored relief and instead declared "the roadless rule must be set aside" and that "[t]herefore, the Court **ORDERS** that the Roadless Rule, 36 CFR §§ 294.10 to 294.14, be permanently enjoined, for the second time."

On February 6, 2007, another Federal district court, in State of California v. USDA, 3:05-cv-03508-EDL (N. D. Cal.), reinstated the 2001 Roadless Rule (including the Tongass-specific amendment) and specified that "federal defendants are enjoined from taking any further action contrary to the Roadless Rule...."

As the California court order (Magistrate LaPorte) expressly preserved the Tongass-specific amendment exempting the Tongass from the 2001 rule, operations on the Tongass are not affected by the Wyoming court ruling (Judge Brimmer) to set aside the 2001 Rule or the California order generally directing compliance with the 2001 Rule.

Inventoried Roadless Areas in the Forest Plan

In the 2008 Tongass Forest Plan Amendment, each inventoried roadless area was evaluated by the quality of the roadless area. As the Forest Plan alternatives were developed with higher levels of timber harvest, the minimum amount of roadless acres needed were included in LUDs that allowed development, starting with lower-value roadless areas. In this way, development is allowed in roadless areas only to the extent necessary to achieve the multiple-use objectives, including timber production. In addition, a timber sale program adaptive management strategy limits timber harvest to lower-value roadless areas until harvest levels rise sufficiently to warrant allowing timber harvest in higher-value roadless areas. Most of the Navy project area is in Phase 1 of the timber sale program adaptive management strategy except for the Navy watershed that is now in Phase 2. The units proposed in the Draft EIS, Alternatives B and C, for the Navy watershed (Phase 2) are not included in the Final EIS.

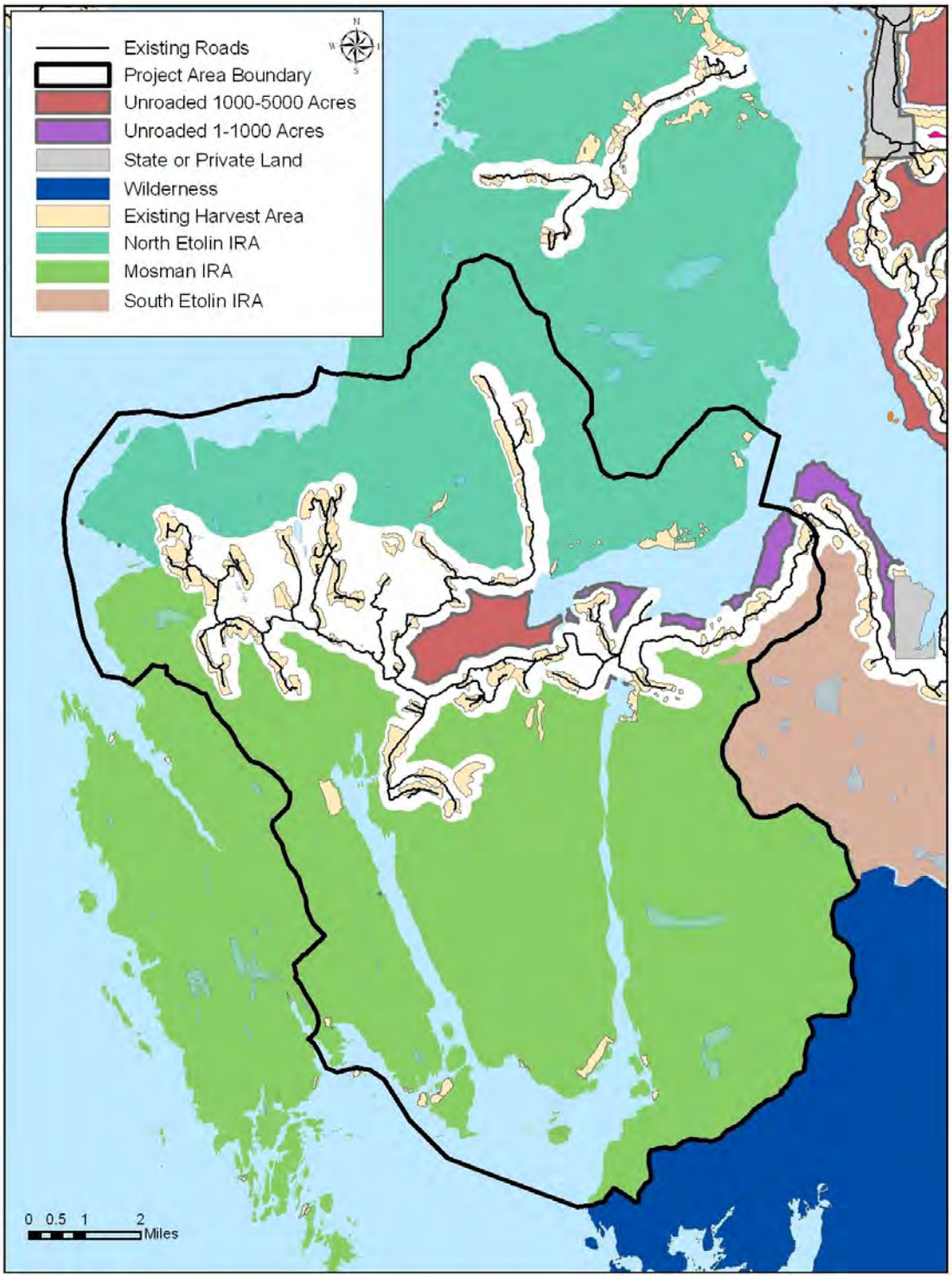
Analysis Area

The most recent roadless inventory areas were prepared for the 2003 Forest Plan SEIS. The analysis areas used for this analysis were North Etolin Roadless Area #232, Mosman Roadless Area #233, and South Etolin Roadless #234.

Summary of Effects

The proposed timber harvest and road building in all action alternatives will increase the developed acres by further extensions into the roadless areas, but overall large portions will remain intact, and at most 4 percent of the total roadless areas will be affected by Alternative C.

Figure 3-7
Roadless Areas in the Vicinity of the Project Area



Source: J. Llanos; GIS

Affected Environment

The Navy project area includes parts of three inventoried roadless areas: North Etolin Roadless Area #232, Mosman Roadless Area #233, and South Etolin Roadless Area #234.

In addition, the project area includes 2,590 acres of unroaded areas. The largest of these is about 1,320 acres at the head of Anita Bay, with five smaller areas located along the south side of Anita Bay, among the previously harvested units and roaded area.

Appendix C of the 2003 SEIS was reviewed for roadless characteristics that might not have been covered in the other resource analyses completed for the Navy project and summarized in this EIS. This analysis focuses on the North Etolin and Mosman Roadless Areas because only a small portion of the South Etolin Roadless Area is within the project boundary, and no timber harvest or road building is proposed in any alternative in the South Etolin Roadless Area.

There are no municipal watersheds on Etolin Island, and no terrestrial threatened or endangered species. Both the North Etolin and Mosman Roadless Areas are mostly natural appearing and influenced by the developed areas along some of the boundaries. To the north of the Navy project area, in the North Etolin Roadless Area, the King George Timber Sale timber harvest and road building nearly isolated the north quarter of the roadless area. These impacts to the North Etolin Roadless Area were considered in the 2003 SEIS and included as developed in the inventory.

Air quality is excellent and soils are typical of those found throughout Southeast Alaska. The opportunities for solitude are moderate to high and primitive recreation opportunities are high to very high. Elk were introduced on the island in 1986 as a cooperative project with the Alaska Department of Fish & Game. The introduced elk population on Etolin Island is unique to Southeast Alaska, but is not a valuable attribute for wilderness.

The coarse canopy trees and top quartile deer habitat are generally well distributed throughout the Navy project area, with nothing unique by roadless area. The young growth forest is largely in the roaded portions of the Navy project area, with some in beach fringes from older beach logging.

No marbled murrelet nests have been found, after thousands of acres surveyed. There are areas of higher murrelet activity noted, but these do not necessarily mean nest areas. Many of the goshawk nests are along the existing road system and are well protected with buffers, again nothing notable by roadless area.

No unique areas of sensitive plant populations were identified. See the Botany section in this chapter for more information.

North Etolin Roadless Area #232

The North Etolin Inventoried Roadless Area is located on the north end of Etolin Island and is bounded by Chichagof Pass to the north, Stikine Strait on the northwest, Zimovia Strait on the east, and Anita Bay forms the boundary to the south. A detailed description of the North Etolin Roadless Area can be found in Appendix C of the Final SEIS (pages C1-286 to 296).

Mosman Roadless Area #233

The Mosman Roadless Area is located in the central-western portion of Etolin Island. Road construction and timber harvest activities have separated the Mosman Roadless Area into three distinct areas separated from one another by Burnett and Mosman Inlets. It is bounded by Clarence Strait on the west and a portion of the south, the South Etolin Roadless Area on the east, the South Etolin Wilderness on a portion of the south and east, Ernest Sound to the south, and an area of roads and harvest units to the north. A detailed description of the Mosman Roadless Area #233 can be found in Appendix C of the Final SEIS (pages C1-297 to 306).

South Etolin Roadless Area #234

The South Etolin Roadless Area is located on the east side of southern Etolin Island. It encompasses the east peninsula, as well as a more centrally located portion of the island. The area is bordered to the east by Zimovia Strait, by forest roads and associated harvest units to the north, by the Mosman Roadless Area to the west, and the South Etolin Wilderness and Menefee Inlet extend north into the area. A detailed description of the South Etolin Roadless Area #234 can be found in Appendix C of the Final SEIS (pages C1-308 to 316). No roads or units are proposed within South Etolin Roadless Area.

Unroaded Areas

An unroaded area is an undeveloped area typically less than 5,000 acres, but of a size and configuration sufficient to protect the inherent characteristics associated with its unroaded condition. These unroaded areas were identified for the analysis in the 2003 Forest Plan SEIS. An unroaded area of about 1,320 acres is located at the head of Anita Bay, south of the North Etolin Roadless Area, and north of the Mosman Roadless Area. No unique features have been identified in this unroaded area that is surrounded by existing roads on three sides. Five smaller unroaded areas are located in the developed area to the south of Anita Bay, totaling about 1,270 acres. Much of these areas are protected by the 1,000-foot beach fringe buffer. No unique features have been identified in these smaller patches either.

Environmental Effects

Direct and Indirect Effects

Table 3-8 lists the number of acres of roadless areas affected, and the miles of new proposed roads in roadless areas. The acres affected include the area residing in the zone of influence around units and roads. Alternative F, there are no roads or units proposed within inventoried roadless areas; the acres affected in Alternative F are only in the zone of influence.

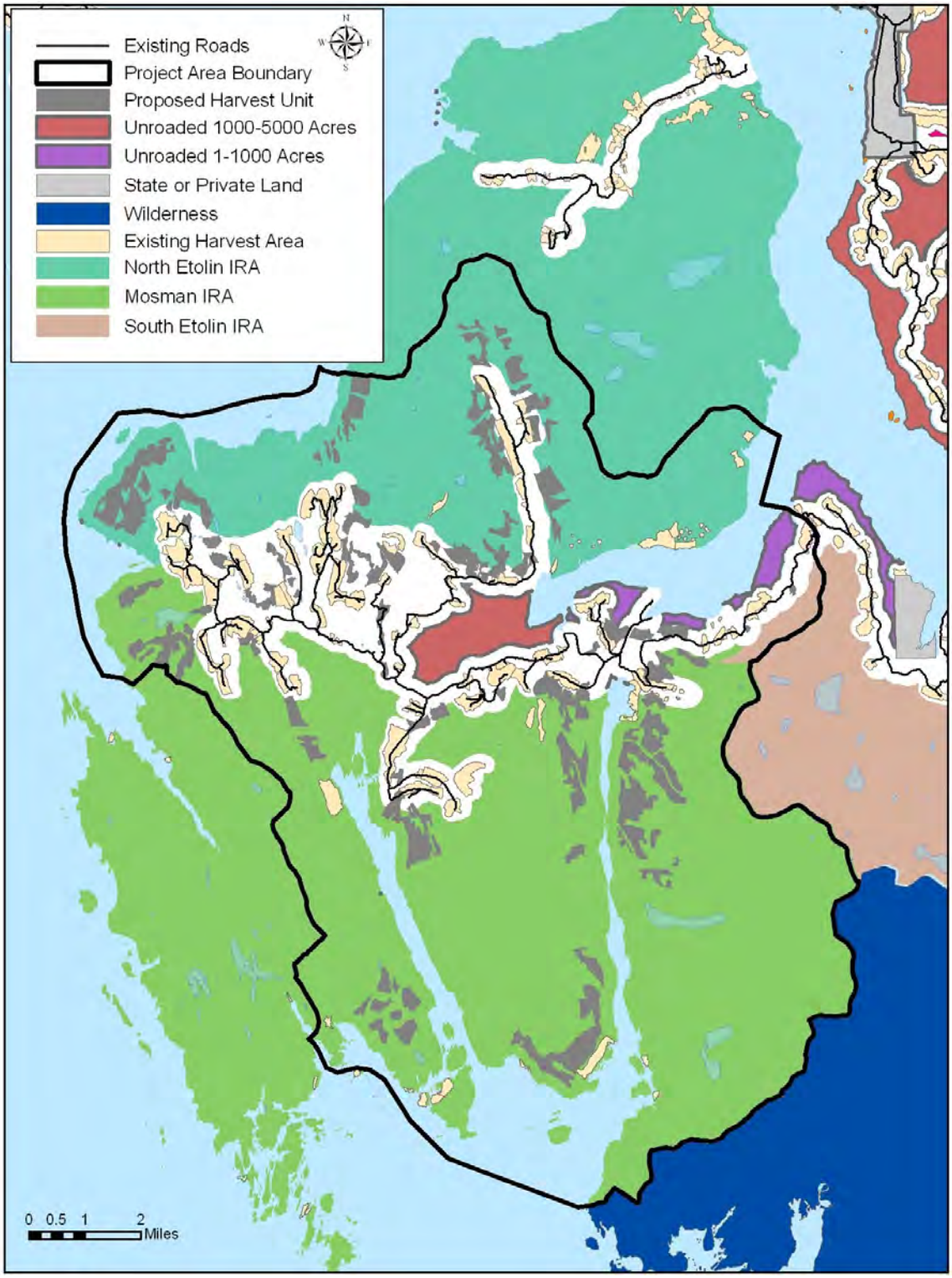
Table 3-8
Acres of Roadless Areas Affected by Harvest and Road Construction by Alternative

	Mosman Roadless Area	North Etolin Roadless Area	South Etolin Roadless Area	Total Roadless Acres	Percent of Roadless Acres in Project Area	Percent of Total Mosman & N. Etolin Roadless Area Acres
Total Acres	**56,757**	**41,740**	**28,679**	**127,176**		
Acres Affected by Alternative[1]				**Total Acres Affected**		
Alt A	0	0	0	**0**	0	0
Alt B	1,521	889	6	**2,416**	4%	2%
Alt C	3,379	1998	6	**5,383**	9%	4%
Alt D	1,636	539	6	**2,181**	4%	2%
Alt E	850	97	6	**953**	2%	1%
Alt F[3]	176	91	6	**273**	0.5%	0.2%
Miles of New Road Proposed[2]	**Miles**	**Miles**	**Miles**	**Total Miles in Roadless Areas**		
Alt A	0	0	0	**0**		
Alt B	3.9	3.1	0	**7.0**		
Alt C	10.6	6.4	0	**17.0**		
Alt D	3.6	1.4	0	**5.0**		
Alt E	1.9	0	0	**1.9**		
Alt F	0	0	0	**0**		

[1]Acres affected by alternative includes the zone of influence defined as 1,200 feet from existing and proposed roads, and the cable/shovel harvest units plus 600 feet from those units, but does not include helicopter units.
[2] Miles of New Road Proposed includes NFS roads and temporary roads.
[3] Acres affected in Alternative F are only in the zone of influence.
Source: GIS

The following effects are synthesized from the other resource sections in Chapter 3 of this EIS and supported by each resource report in the project record. The effects to the roadless characteristics by the activities proposed are within the analysis area for these resources and no unique roadless character was identified for either roadless area. This discussion focuses on the effects to Mosman and North Etolin Roadless Areas because only a small portion of the South Etolin Roadless Area is within the Navy project area, and only an estimated 6 acres would be indirectly affected by units near the South Etolin Roadless Area in any alternative.

Figure 3-8
Proposed Harvest Units and Roads in Relation to the Roadless Areas



Source: J. Llanos; GIS

Effects to Both Mosman and North Etolin Inventoried Roadless Areas

No caves will be affected by any alternative, and the karst features in the Kindergarten Bay area have been protected by locating roads and units to minimize effects to the internal drainage system and downslope wetlands. Retaining trees along the stream buffer is expected to minimize stream impacts as well.

None of the proposed alternatives will affect known cultural sites because nearly all sites in the area are located within protected beach and estuary fringe buffers. The Etolin canoe site is outside the buffer, but no activities are proposed within approximately 1,900 feet of the canoe. Any additional discoveries made during project implementation are protected by standard contract clauses that automatically require activities to halt until consultation requirements under 36 CFR 800.13 are met and mitigation measures applied.

Use of Etolin Island by people is largely hunting, with some trapping and dispersed camping, beachcombing, and hiking with travel to the island in personal watercraft. Most use occurs at the 15 inventoried recreation places surrounding the water boundaries of the roadless areas, as described in the Recreation section. Alternatives with new road building change the type of recreation use available. Even if roads are closed, they provide hiking access and lessen the degree of effort needed to reach previously isolated areas, changing the character from undeveloped to developed. No roads are proposed in any roadless area in Alternatives F and A (No Action). All alternatives meet the scenic integrity objectives adopted by the Forest Plan, with the exception of the CCR15 prescription in some settings in Units 112 and 113 in Alternative C (see Scenery section of this chapter).

An analysis of habitat connectivity on Etolin Island showed that all OGRs or non-development LUDs are connected to at least one other component of the conservation strategy by contiguous productive old growth, although most of the connections are less than 1,000 feet wide in many locations, both naturally and as a result of past timber harvest. Contiguous connections between OGRs on the north half and south half of the island were historically marginal, broken by small sections of scrub forest, and have been seriously impacted by past timber harvest, particularly in the area between Anita Bay and Burnett Inlet. Only Alternative E avoids further negative impact to connectivity through this “pinch point” by not proposing any new roads or harvest units in this area. All action alternatives would harvest the one remaining corridor connecting to the South Mosman SOGR and would affect the corridor northwest of the head of Anita Bay. See the environment and effects sections under Issue 2 for more detailed discussions.

No unique areas of sensitive plant populations were identified within the project area. The consequences on the Wright’s filmy fern are estimated as moderate because this particular species is likely more common than previously thought. The consequences of adverse effects on Davy mannagrass are low in the Navy project area because effects to the population documented in the Navy area can be mitigated, and again, this plant may occur more commonly and more abundantly on the Tongass than previously thought. For all the documented and suspected sensitive plants in the project area, the determination is that individual plants may be adversely impacted, but it is not likely to result in a loss of viability in the Tongass or cause a trend to Federal listing for all the action alternatives.

Mosman

The most acres impacted in the Mosman Roadless Area would be under Alternative C, with about 3,400 acres affected, about 6 percent of the total roadless acres. With over 53,000 acres remaining undeveloped to be considered for potential wilderness recommendation in the next round of Forest planning, and none of the unique features of the area impacted, well above the 5,000-acre minimum remain to be evaluated. Its current wilderness attribute rating score (WARS) of 22 ranks 38th from the highest, along with eight other roadless areas among the 109 inventoried roadless areas on the Tongass. This rating score will also be re-evaluated during the next round of Forest planning. All other alternatives affect fewer roadless acres, from 3 percent in Alternatives B and D, to 1 percent in Alternative E and 0.3 percent in Alternative F, leaving these acres remaining undeveloped for future wilderness evaluation.

The Navy activities propose the most additional roads in the Mosman Roadless Area, from about 2 miles in Alternative E to 4 miles in Alternatives B and D to almost 11 miles in Alternative C. All roads are extensions of existing road systems, except for Alternative C where a new system of roads would be started from the Mosman Inlet LTF in the southwest corner of the Mosman Roadless Area. This first road system in the southern part of the Mosman Roadless Area would concentrate the undeveloped area in the middle of western portion, to the west of Mosman Inlet. The roads proposed in Alternative C would also narrow the corridor of undisturbed land in the northwest corner of the Mosman Roadless Area surrounding Kindergarten Lake and connecting to the Steamer medium Old-growth Reserve. Alternatives B and D propose fewer roads in this area and would not cause as narrow a corridor as Alternative C. Alternatives B and D also do not propose any new road system in the southwest corner of the Mosman Roadless Area.

The most interior habitat will be reduced by timber harvest and road construction will be in the Mosman Roadless Area under Alternatives B and C. Other alternatives would have less impact on the interior habitat and on species such as brown creeper, red-breasted sapsucker and hairy woodpecker that prefer interior condition. Because the small OGR is located along the east side of Mosman Inlet in the 2008 Forest Plan decision, all alternatives protect much of the interior habitat there. No alternatives propose any harvest in the Navy drainage interior habitat.

The loose-flowered bluegrass, a suspected sensitive plant, will have no impact by any alternatives because the probable location of plants in the LTF area of the Navy watershed no longer has units, roads, or LTF proposed in any alternative. Across the Tongass, beach and riparian buffers protect the loose-flowered bluegrass habitat.

Only a small portion of previous harvest can be seen from Clarence Strait, and effects of partial retention timber harvests (single-tree selection with 70 percent retention) are likely to be unnoticed by the casual observer due to the distance (5-8 miles) of the travel route, mostly ferry and tour ship, to the shoreline of the Mosman Roadless Area.

North Etolin

The most acres impacted in the North Etolin Roadless Area would be with Alternative C, just less than 2,000 acres, about 5 percent of the total roadless area acres (2000/42000). With almost 40,000 acres remaining undeveloped to be considered for potential wilderness recommendation in the next round of Forest planning, and none of the unique features of the area are impacted, well above the 5,000 acre minimum remain to be evaluated. Its current wilderness attribute rating score (WARS) of 18, a rank of 84th from the highest, along with eight other roadless areas among the 109

inventoried roadless areas on the Tongass, will be re-evaluated at that time as well. All other alternatives affect fewer roadless acres, from 2 percent in Alternative B, 1 percent in Alternative D to 0.2 percent in Alternatives E and F, leaving these acres remaining undeveloped for future wilderness evaluation.

The extension of proposed roads into the North Etolin roadless area is less than those proposed in the Mosman Roadless Area, with over 6 miles proposed in Alternative C, 3 miles in Alternative B, over 1 mile in Alternative D and none proposed in Alternatives E and F. Alternative C would narrow the corridor of undisturbed land north of Kindergarten Bay with the extended road system there and two large units (112 and 113) of uneven-aged and two-aged harvests along Stikine Strait. Alternative E proposes uneven-aged harvest for Units 112 and 113, with no road access. This perscription would not cause the same kind of narrowing of undisturbed land as Alternative C.

The southwest corner of the roadless area will remain unchanged as natural existing visual quality condition in the OGR, and change from natural to slightly altered in the scenic viewshed. The cumulative effects result in a future visual condition that corresponds to a partial retention visual quality objective and meets the Forest Plan Scenery Standards and Guidelines.

Effects on Unroaded Areas

An unroaded area of approximately 1,320 acres is located at the head of Anita Bay, between the North Etolin and Mosman Inventoried Roadless Areas. The character and values of this unroaded portion of the project area are already heavily influenced by the surrounding roads and previous harvest units. No additional roads or units are proposed within this unroaded portion and there are no unique values identified within this area that would be affected by any of the Navy alternatives. All the action alternatives propose some harvest on the other side of the road to the north of this unroaded area and Alternatives C and E propose a small clearcut (Unit 114, about 14 acres) and temporary road (0.16 mile) that would touch the a northern tip of the unroaded area. After the disturbance (noise, traffic, people) during harvest operations in these adjacent areas, no changes to the unroaded character are predicted.

No timber harvest or roads are proposed in the remaining smaller unroaded areas along the south side of Anita Bay. These five areas total about 1,270 acres and are largely within the 1,000-foot beach buffer.

Cumulative Effects

Past timber harvest activities have reduced the overall size of the inventoried roadless areas on Etolin Island. Approximately 20,390 acres on Etolin Island have been previously developed by timber harvest and roads, largely along the south side of Anita Bay and extending westward toward Kindergarten Bay, plus the acres impacted (about 2,640) by the King George Timber Sale to the north of the Navy project area, as mentioned above. The boundaries of the North and South Etolin and Mosman Inventoried Roadless Areas account for these changes and were included in the 2003 SEIS wilderness evaluation. The proposed timber harvest and road building in all action alternatives will increase the developed acres by further extensions into the roadless areas, but overall large portions will remain unaffected, and at most 4 percent of the total roadless areas will be affected by Alternative C.

The potential for timber harvest, road construction, and development in the future have the potential to affect the character of the roadless areas. At this time, three salvage sales, Porcupine Salvage (which sold January 2009), North Etolin Salvage, and

Fishtrap Special Salvage are planned along three existing roads (51540, 6538, and 51581) on Etolin Island. The Wrangell District Roadside Timber Sales, which would also include salvage harvest along existing roads, was added to the Schedule of Proposed Actions (SOPA) in January 2009. No cumulative effects to roadless characteristics are anticipated, because the sales will occur in roaded areas only and no effects to roadless areas will occur. Pre-commercial thinning is anticipated in the project area; thinning projects would use existing roads and occur in developed areas, so no additional impacts would occur. Road maintenance would continue on a periodic basis, but would not have additional impacts on the roadless areas.

In the Navy project area, about 14,000 acres (18 percent of the project area) are suitable and available for timber harvest, so large portions of the area will remain undisturbed into the future, even if the maximum allowable harvest occurs over the next 100 years. The most acres proposed for harvest in this entry are in Alternative C, over 6,000, or about 43 percent of the suitable timber acres. The fewest acres proposed for harvest are in Alternative F, about 1,250 acres, about 9 percent, with Alternatives D, B, and E proposing 17 percent to 24 percent of the suitable acres to be harvested in this entry.

Regarding the roadless component of the Navy project area, over 61,000 acres are roadless (about 80 percent of the total project area) including the 2,600 unroaded acres around Anita Bay. Alternative C would directly affect the most vegetation by cutting trees in cable-harvest units and clearing roads within the roadless acres, about 1,650 acres and 17 miles of new NFS and temporary roads within the roadless areas. In addition, Alternative C would harvest almost 3,000 acres with helicopter yarding, but these units leave 70 percent of the timber stand intact and do not require any road building. This is contrasted with Alternative F, where no vegetation would be removed within the roadless areas, not even using helicopter yarding. Alternative B would remove vegetation from over 600 acres with cable yarding and 7 miles of roads, and almost 1,700 acres by helicopter. Alternative D has a similar amount of cable-yarding units, about 550 acres and 5 miles of road, but less than 650 acres of helicopter harvest. Alternative E has less than 200 acres of cable unit harvest with just under 2 miles of road, but almost 2,300 acres of helicopter harvest within the Navy project area.

Botany

Introduction

This section explains the direct, indirect and cumulative effects to threatened, endangered, sensitive (TES) and rare plant species.

The Endangered Species Act of 1973 governs the protection of listed species and the ecosystems upon which they depend. The Tongass Land Management Plan (TLMP) provides guidelines for identifying and considering the conservation of rare plant communities during project planning (USDA 2008). The National Forest Management Act (NFMA) (36 CFR 219.19 Sept 30, 1982) states that Forest planning must "…provide for the diversity of plant and animal communities based on the suitability and capability of the specific land area". It also provides direction for the analysis of project impacts to rare plant populations, with the evaluation of each rare plant observed documented within the resource report. The USDA Departmental Regulation 9500-004 directs the National Forest to provide habitat for all existing native and desired non-native plants, to maintain at least a viable population of such species, and maintain diversity of plant and animal communities. Federal regulation 36 CFR 219.27 (g) provides that management prescriptions, when appropriate and to the extent practicable, shall preserve and enhance the diversity of plant and animal communities. In 1992, the Chief of the Forest Service issued a statement committing the Forest Service to the practice of ecosystem management, which is an ecological approach to managing National Forests and Grasslands for multiple purposes.

Analysis Area

The analysis area used for direct effects is the harvest units and the cleared road corridor for proposed new road construction. The analysis area for indirect effects is a 100-meter buffer around the harvest units and proposed new road construction.

The analysis area for cumulative effects is Etolin Island. Etolin Island was chosen because it is a large island with defined geographic barriers to cross-pollination and propagation of plants. A larger area such as the Tongass National Forest or the entire range of the species of interest would be too large to detail all foreseeable past, present and future activities with potential to affect population viability.

Summary of Effects

No threatened or endangered plant species have been identified on the Tongass National Forest. The proposed action will have negative effects on individuals or populations of rare but will not affect species viability. The proposed action may have negative effects on individuals or populations of sensitive species but will not affect species viability.

Affected Environment

Two hundred and fifty-five vascular plant species were identified within the project area. A complete list of the vascular plants observed is in Appendix A of the Botany Resource Report in the project file. Sixty-four surveys were completed within the project area, totaling 134,080 meters in length. No threatened or endangered plant species are known or suspected to occur in Southeast Alaska. Of the 134,080 meters

of survey, 27 percent of the survey was conducted inside of units in the original unit pool. Out of an original unit pool of 367 settings, 122 settings (33 percent) were surveyed to some degree. A total of 6,613 meters of survey was conducted in the corridor of planned new road construction under all alternatives, giving an approximate figure of 15 percent of planned roads surveyed. A survey route map is in the Botany Resource Report.

Sensitive Plants

Seventeen vascular plant species or subspecies and one lichen species have been designated as sensitive by the Regional Forester for the Alaska Region. Three species are known to occur and six are suspected to occur on Etolin Island.

Table 3-9
Known or Suspected R10 Sensitive Plants and Their Associated Habitat on Etolin Island

Species	Known or Suspected	Common Name	Habitat (DeLapp 1992, Stensvold 2005, Goldstein 2008)
Botrychium spathulatum	Suspected	Spathulate moonwort	Upper beach meadows; alpine areas
Cirsium edule	Suspected	Edible thistle	Wet meadows, woods; forest and stream edges; dry meadows; landslide talus
Cypripedium montanum	Known	Mountain lady's slipper	Open forest; beach meadows; peatlands
Cypripedium parviflorum	Suspected	Yellow lady's slipper	Peatlands
Ligusticum calderi	Suspected	Calder's lovage	Alpine and subalpine forest edges; wet meadows
Lobaria amplissima	Known	Dillman's Lichen	Tree trunks and limbs on old- growth beach fringe
Piperia unalascensis	Suspected	Slender spire orchid	Dry open sites; tall shrublands in riparian zones; mesic meadows; dry coniferous forests
Platanthera orbiculata	Known	Lesser roundleaved rein orchid	Low-elevation forests and scrub
Sidalcea hendersonii	Suspected	Henderson's checkermallow	Estuarine meadows

Source: USDA Forest Service, Region 10 Wildlife, Fisheries, Ecology and Watershed Staff retrieved from: http://fsweb.r10.fs.fed.us/staffs/wfew/index_wfew.shtml

Rare Plants

A rare plant is a plant species, subspecies or variety that:

- is on the Alaska Natural Heritage Program (ANHP) Rare Vascular Plant Tracking List that are known or suspected to occur on the Tongass (ANHP, 2007), is considered S1 and S2 in State ranking (some S3 are considered), and is not yet on the sensitive plant list for the Tongass,

- is proposed upon consultation and agreement among Tongass ecologists, District botanists, and the Region 10 botanist because of rarity on the Tongass (i.e. plants with range edges or disjunct populations on the Tongass but not yet given a State ranking on the ANHP list), or
- has been or is being raised as an issue because of rarity or conservation concerns (through the NEPA process).

Table 3-10
Rare Plants Known to be Present in the Cumulative Effects Analysis Area (Etolin Island)

Species	Common name	Number of Populations
Botrychium lanceolatum (Gmel.) Angstr.	Lance-leaf moonwort	1
Ambrosia chamissonis (Less.) Greene	Silver burr ragweed	1
Galium kamschaticum Steller ex. J.A. et J.A. Schultes	Northern bedstraw	3
*Listera convallarioide*s (Sw.) Nutt ex Ell	Broad-lipped twayblade	6
Lycopus uniflorus Michx.	Northern bugleweed	1
Malaxis paludosa (L.) Sw.	Bog adder's mouth orchid	2
Tiarella trifoliata L. var. *laciniata* (Hook.) Wheelock	Laciniate foamflower	10

Source: USDA Forest Service, Tongass National Forest GIS library J:fsfiles/ref/library/gis/tnf/tongass

Environmental Effects

Direct Effects

Timber harvest has varying degrees of impacts on vegetation depending on harvest method used. In even-aged harvest, all trees of marketable size are cut and removed from the site. In partial retention, harvest trees are left clumped or scattered across the harvest unit. Shovel and cable yarding may affect vegetation by crushing plants on the ground. Helicopter yarding may affect vegetation to a lesser degree and often is used in partial-retention harvest. In Southeast Alaska, timber harvest usually results in very dense regrowth of conifer species. Forest floor vegetation is completely suppressed during a period of approximately 10-80 years post harvest when insufficient light penetration of the canopy precludes growth of most forest-floor-vegetation. Precommercial thinning can delay the period of understory suppression but eventually the canopy closes and suppresses the understory.

Plants or their habitats can be affected by timber harvest, road construction, or related activities. Effects can include:

- crushed or buried plants or habitat,
- altered hydrologic processes,
- intensified solar radiation.

The project proposes road building and timber harvest, both which will lead to disturbance of habitat and destruction of rare plants. Road building would cause irreversible impacts on directly affected populations (for directly affected populations, see Table 3-12).

Direct effects occur immediately or soon after the implementation of the action (such as habitat loss, crushing or burying actual plants, sediment accumulation etc.).

Sensitive Plants

No sensitive plants will be directly affected by the project.

Table 3-11 shows number of populations (#) and percent of known populations (%) on Etolin Island affected by each alternative.

Table 3-11
Direct Effects on Known Sensitive Plant Populations on Etolin Island

Species	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
	# [1]	% [2]	#	%	#	%	#	%	#	%	#	%
Mountain Lady's slipper	0	0	0	0	0	0	0	0	0	0	0	0
Dillman's Lichen	0	0	0	0	0	0	0	0	0	0	0	0
Round-leafed rein orchid	0	0	0	0	0	0	0	0	0	0	0	0

[1] Number of populations affected
[2] Percent of known populations affected
Source: USDA Forest Service, Tongass National Forest GIS library J:fsfiles/ref/library/gis/tnf/tongass

Rare Plants

Several populations of rare plants were identified in the initial unit pool and were protected by redesigning the units to avoid these populations. The two remaining populations of laciniate foamflower, consisting of a single individual in Unit 1 and two individuals in Unit 8 were judged too small to warrant special protection.

Table 3-12 shows number of populations (#) and percent of known populations (%) of Laciniate foamflower on Etolin Island affected by each alternative.

Table 3-12
Direct Effects to Rare Plants on Etolin Island

Species	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
	# [1]	% [2]	#	%	#	%	#	%	#	%	#	%
Laciniate foamflower	0	0	0	0	2	20	0	0	0	0	0	0

[1] Number of populations affected
[2] Percent of known populations affected
Source: USDA Forest Service, Tongass National Forest GIS library J:fsfiles/ref/library/gis/tnf/tongass

Indirect Effects

Indirect effects are those effects that are "reasonably likely" to occur at a later point in time after project implementation (such as changes in hydrology or solar radiation

intensities). Due to the difficulty in predicting these effects with certainty, any population within 100 meters of a road or timber harvest unit was considered indirectly affected.

Sensitive Plant Species

Mountain lady's slipper *Cypripedium montanum Douglas ex Lindl*

Habitats include open forest, beach meadows, and peatlands. This plant has been found on Etolin Island. A population of 100-400 individuals (Goldstein 2008) is located in the project area in a limestone influenced wet complex (boggy area) next to an existing road.

It is located approximately 200 feet from a proposed road and 400 feet from a proposed unit. Since this population is located closer to existing roads and harvested stands than it is to planned roads or stands and, survived the previous activity, it is unlikely that the proposed action will adversely affect this population. The population trend of this population is suspected of moving downward due to herbivore impacts (Goldstein 2008).

Lesser roundleaved rein orchid *Platanthera orbiculata (Pursh) Lindl*.

In Southeast Alaska, typical habitat is forest floor at low elevations (<1000 ft.) in areas of sparse forest floor vegetation. In Southeast Alaska it is often, but not always, found near the base of mature red cedar (*Thuja plicata*) trees, and has also been found in 80-120 year old young growth stands of western hemlock (*Tsuga heterophylla*) and Sitka spruce (*Picea sitchensis*).

Project surveys found six locations of lesser roundleaved orchid on Etolin Island. Two populations are in South Etolin Wilderness and will not be affected by the proposed action. Two populations, nine and ten individuals, are located 400-500 feet from Unit 41. These populations are not likely to be directly or indirectly affected by the proposed action. One population, ten plants, is located approximately 75 feet from Unit 75. This population could be indirectly affected by implementation due to increased light levels affecting competition for light and space due to understory release.

Table 3-13 shows number of populations (#) and percent of known populations (%) on Etolin Island affected by each alternative.

Table 3-13
Indirect Effects on Known Sensitive Plant Populations on Etolin Island

Species	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
	# [1]	% [2]	#	%	#	%	#	%	#	%	#	%
Mountain Lady's slipper	-	-	-	-	1	100	1	100	-	-	-	-
Dillman's Lichen	-	-	-	-	-	-	-	-	-	-	-	-
Round-leafed rein orchid	-	-	1	20	1	20	1	20	1	20	1	20

[1] Number of populations affected
[2] Percent of known populations affected
Source: USDA Forest Service, Tongass National Forest GIS library
J:fsfiles/ref/library/gis/tnf/tongass

Rare Plants

Table 3-14 shows number of populations and percent of known populations on Etolin Island affected by each alternative.

The populations located near timber harvest and road construction areas may be negatively affected at some time in the future due to the causes noted above. These effects may range from no effect at all, through some level of decline, to complete loss of the population.

Three populations of northern bedstraw have been identified that are close to existing roads and planned timber harvest. These may experience effects due to changes in light and hydrologic regime.

One population of bog adder's mouth orchid is located about 300 feet from planned timber harvest under all alternatives except Alternative E.

Table 3-14
Indirect Effects to Affected Rare Plants on Etolin Island

Species	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
	# [1]	% [2]	#	%	#	%	#	%	#	%	#	%
Northern bedstraw	-	-	2	67	3	100	-	-	1	33	-	-
Broad-lipped twayblade	-	-	2	33	3	50	2	33	2	33	2	33
Bog adders' mouth orchid	-	-	1	50	1	50	1	50	0	0	1	50
Laciniate foamflower	-	-	1	10	6	60	-	-	1	10	-	-

[1] Number of populations affected
[2] Percent of known populations affected
Source: USDA Forest Service, Tongass National Forest GIS library
J:fsfiles/ref/library/gis/tnf/tongass

Cumulative Effects

The National Environmental Policy Act requires that effects on a resource be considered from the perspective of accumulating effects by actions in the past, present and foreseeable future in order to prevent incremental negative effects that might otherwise escape notice resulting in long-term degradation of the resource.

Activities causing disturbance of vegetation in the past, present, and future are largely restricted to road building, timber production and dispersed recreation.

Twenty-eight out of 34 known populations of rare plants are located in land use designations (LUDs) that include timber harvest (SV, TM, ML). This may be because rare plant surveys have focused on LUDs that include timber harvest. Eighteen of these 34 populations are located in productive old-growth forest, the habitat most likely to be affected by timber harvest.

Past harvest areas can be found over much of the island, including areas that are currently in LUDs where timber harvest is no longer allowed. About 7 percent of productive old growth has been harvested. Little or no botanical surveys were conducted on the island prior to these timber harvest activities, so effects of these activities on rare and sensitive plants are unknown.

No further large-scale timber harvest is planned at this time on Etolin Island. The Porcupine Salvage Timber Sale authorized the salvage harvest of approximately 766,000 board feet (MBF) of blown down sawtimber and utility volume from 26 acres. This project does not authorize any new road construction. This sale was sold in January 2009. A survey conducted for this project found no sensitive plants.

Fishtrap Salvage Timber Sale authorized the harvest of approximately 208 MBF of cedar decline and blown down sawtimber and utility volume from 240 acres adjacent to existing roads. This sale was sold in 2007. A biological evaluation conducted for this project made a determination of *"May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing"* for sensitive plants.

North Etolin Salvage Timber Sale authorizes the harvest of approximately 200 MBF of cedar decline and blown down sawtimber and utility volume along the existing road system. This sale, which had a decision in August 2008, is located on the Honeymoon road system. A biological evaluation conducted for this project made a determination of *"May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing*" for sensitive plants.

The Wrangell District Roadside Timber Sales was added to the Schedule of Proposed Actions (SOPA) in January 2009. This project would harvest up to a total of 5 MMBF of salvage and green fuelwood and sawtimber along existing roads on Wrangell, Zarembo, and Etolin Islands, through multiple small sales. Scoping has just begun for this project.

No large communities, mines, or agricultural lands exist on Etolin Island. Recreation use of the island is light compared to National Forests in the lower 48 states. Several outfitters offer guided camping and hunting trips on the island. Recreational users from Wrangell, Coffman Cove, and other communities travel occasionally to explore and hunt on and off the road system.

Effects of non-timber activities, such as recreation, mining, agriculture, or permanent dwellings, have not caused substantial effects on rare or sensitive plant population viability. No changes to patterns of use by these activities is foreseen in the future.

The risk assessment for species is summarized in Table 3-15.

Table 3-15
Summary of Risk Assessment and Determinations for Sensitive Species

Common Name	Alt. A	Alts. C-F
Known species:		
Mountain lady's slipper	No effect	Likelihood of adverse effects: moderate Consequences of adverse effects: high Determination: Not likely [1]
Dillman's Lichen	No effect	Likelihood of adverse effects: none Determination: No impact
Round-leaved rein orchid	No effect	Likelihood of adverse effects: high Consequences of adverse effects: moderate Determination: Not likely [1]
Suspected species:		
Spathulate moonwort	No effect	Likelihood of adverse effects: none Determination: No impact
Edible thistle	No effect	Likelihood of adverse effects: low Consequences of adverse effects: low Determination: Not likely [1]
Yellow lady's slipper	No effect	Likelihood of adverse effects: moderate Consequences of adverse effects: high Determination: Not likely [1]
Calder's lovage	No effect	Likelihood of adverse effects: moderate Consequences of adverse effects: high Determination: Not likely [1]
Slender spire orchid	No effect	Likelihood of adverse effects: moderate Consequences of adverse effects: high Determination: Not likely [1]
Henderson's checkermallow	No effect	Likelihood of adverse effects: none Determination: No impact

[1] Full text is: "May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."

Source: Heutte, Thomas, Biological Evaluation for Plants, Navy Timber Sale, 9/19/2008, located in Navy Timber Sale Planning File

Mitigation Measures

Forest Plan Standards and Guidelines for road construction and timber sale layout, such as avoidance of wetlands and riparian buffers, protect most rare and sensitive species found in the project area. In addition, several adjustments to unit boundaries were made after publication of the Draft EIS for the Navy Timber Sale.

A population of *Tiarella trifolatia* var. *laciniata* (laciniate three-leaf foamflower), ten individuals, was documented at the edge of Unit 1, within the unit at the confluence of two streams. Shift edge of unit boundary by making a notch 100 feet around the population. This population is likely protected by RMA buffers. This population was depicted further inside the unit in versions of the unit card as published in the Draft EIS. It was concluded, after further field review, that the population is located on the

edge of the unit boundary and was likely mapped inside the unit due to a GPS positional error.

Ten individuals of *Platanthera orbiculata* (round-leaved orchid) were located within the RMA buffer on the east side of Unit 75. The proposed spur road was relocated to establish a 100-foot windfirm buffer to avoid impacts.

One population of *Listera convallarioides* (broad-lipped twayblade), 16 individuals, was documented in Unit 103. Lay out the unit boundary to exclude this population.

One population of *Tiarella trifolatia* var. *laciniata* (laciniate three-leaf foamflower) was documented in Unit 138. Unit boundaries were adjusted to protect the population with a 100-foot buffer.

Monitoring

Little or no information has been documented to assess indirect impacts on understory vegetation by road building or timber harvest. Valuable information may be gained from following up on the known populations indirectly affected by the proposed action. Follow-up monitoring should be conducted on the four populations listed in the Mitigation section 2 and 5 years after conclusion of harvest activities on the units where mitigation measures were enacted.

The population of mountain ladies' slipper orchid should be monitored 2 and 5 years after conclusion of harvest activities on Unit 101.

Invasive Plant Species

Introduction

An invasive plant species is a plant, not native to the ecosystem under consideration, whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). Executive Order 13112, Invasive Species, directs Federal agencies to address the impacts their action may have on invasive species. Forest Service Manual direction further clarifies management for invasive plants on the Tongass National Forest (FSM 2080, Supplement R10 TNF – 2000-2007-1). This report presents the current information about invasive plants in the project area and assesses the potential impacts associated with implementing the alternatives.

Invasive plants can spread by propagules (seeds, spores, or other plant parts capable of reproduction) through ground disturbance such as road and other construction activities. Propagules can be unintentionally carried on vehicles and heavy equipment, hunters' or hikers' clothing, or animal fur, or carried by wind or water. Erosion seeding mix, straw bales for erosion control, or truckloads of soil or gravel can also be contaminated with seeds or spores, or invasive species could be intentionally planted.

Analysis Area

The analysis area for direct, indirect, and cumulative effects from this project is the Navy project area on Etolin Island. This area was determined to be sufficient because of the isolated nature of the project area. Access to the project area is by water or air, interrupting the primary vectors for the spread of invasive plants.

Effects Summary

The Navy project area has relatively few invasive plants. Those that are in the project area are confined to the road corridor and the old campsite. Ground-disturbing activities such as road construction provide a perfect habitat for invasive plants to become established. The primary vectors for introduction of new species into the project area are transport by vehicles and equipment, and in the erosion-control-seed-mix. Equipment cleaning prior to arrival on Etolin Island and the use of materials that comply with TNF standard seed mixture (FSM 2080 TNF supplement R10 2000-2007-1) for erosion control will greatly reduce the likelihood of introducing new invasive plants in the project area.

Affected Environment

Invasive Plant Species in the Project Area

Surveys conducted along roads, rock pits and at the administrative sites found relatively few invasive plant species. Seven of these are considered high priority or plants of concern, and described in the table below.

Four of these – the hawkweed, ox-eye daisy, and reed canary grass – are ranked as moderately to highly invasive (Alaska National Heritage Program Invasive Plant Ranking System, 2007).

Table 3-16
Non-native Plants of Concern in the Project Area

Species	Common Name	AKNHP Invasiveness Rank	Where Found	Control Status
Phalaris arundinacea L	reed canary grass	83	Most common on roads 51540 and 51720, where it was planted for erosion control.	Well-established and impossible to eradicate, so not a high-priority plant for control in established areas.
Hieracium	hawkweeds	79	Yellow hawkweed on the 6544 road. Orange hawkweed found at Mosman Oyster Farm and Burnett Hatchery.	Yellow hawkweed was eradicated. Permittees to control orange hawkweed.
Leucanthemum vulgare	ox-eye daisy	61	Few plants near Anita Bay North LTF	Contain infestation and prevent spread to other areas on island.
Taraxacum officinale	common dandelion	58	On or alongside roads on western side of island.	Hand picked when/where feasible.
Hypochaeris radicata	hairy cat's ear	NR[1]	Along 6544 and 6545 Roads	Difficult to eradicate; control status unknown at this time
Gnaphalium uliginosum	marsh cudweed	NR	Floor of two rock pits on the 6548 and 6545 roads.	"Nuisance" species; control status unknown at this time
Mycelis muralis	wall lettuce	32	Old camp site near Anita Bay South LTF	Hand pulled when/where feasible.

[1] not ranked by AKNHP
Source: Field survey information and Alaska Natural Heritage Program's AKEPIC database

Habitat Vulnerability and Risk of Invasion

Habitat vulnerability is determined by plant community structure, species composition, soils, and hydrology. A wide variety of habitats within the project area would be impacted to varying degrees by project activities. Community vulnerability and proximity to sources of invasive plant propagules (seeds and other plant parts capable of reproduction) determine risk of infestation by invasive plants. Areas near ground-disturbing activities (for instance, road construction) and vulnerable due to plant community structure and composition are at highest risk of infestation by invasive plants.

Risk of invasion is ranked by considering a combination of habitat vulnerability due to ecological factors such as plant community structure and composition, and proximity to ground-disturbing activities, notably road construction. Habitats with a lack of disturbance, and environmental extremes such as the high degree of shading found on closed-canopy forest floors, the extremely low pH of sphagnum bogs, or short growing season and lack of soil in rocky alpine outcrops are considered at low risk. Areas of high disturbance, moderate soil conditions of moisture and pH, and lack of shading are

considered to be at high risk. Areas with a mixture of factors are classified as moderate risk.

In the project area, habitat types with the highest vulnerability include estuaries, lake margins, beaches, riparian areas, and upper beach meadows. Where these areas are near ground-disturbing activities, the habitat risk is the highest. Stream banks and shallow fresh-water pond habitats have moderate habitat vulnerability, but in proximity to ground-disturbing activities still have a relatively high risk. Habitat types such as alder forest, forest edge, scrub shrublands, mixed conifer/deciduous forest, sphagum bogs, and coniferous forest are considered as low-vulnerability plant communities, but with proximity to ground-disturbing activities are considered at moderately low habitat risk. In general, for any given habitat type, ground-disturbing activities, particularly road building, is the primary factor for increasing the risk of introduction of invasive plants.

Environmental Effects

The project proposes to develop new and reuse existing rock pits, and build roads, an LTF, sort yard, and conduct timber harvest. Road construction or maintenance will result in increased disturbance of the current road system as well as creating extensive disturbance where new road is constructed. Roadside areas are at a high risk of establishment of invasive species. Areas immediately adjacent to road building will experience disturbance, opening the habitat to establishment of invasive plant species.

Road construction allows increased spread and opens new routes of introduction of existing invasive species, exposing new habitats to invasive plant propagule pressure. These activities carry a high risk for new introductions of invasive plant species to vulnerable habitats in close proximity to project activities. Vectors include erosion control plantings on disturbed areas adjacent to roads and contaminated vehicles and heavy equipment. Opening new roads could also lead to increased recreational vehicle and foot traffic in areas previously less accessible.

Mobilization of motor vehicles and construction equipment from more heavily infested areas increases the risk of importing additional invasive plants. Increased traffic along the road has the potential to spread the existing weeds, as well as new introductions of invasive plant species.

Clearcutting or partial harvesting a closed-canopy forest will allow more light into the stand, alter the vegetation composition, and generally make the stand more susceptible to invasion of invasive plants. Based on examination of areas of recently clearcut and young growth forest in many parts of the Tongass National Forest, harvested areas are at a low risk for establishment of invasive plants due to the shading caused by rapid regrowth of understory vegetation and the development of a dense forest stand.

Direct and Indirect Effects

All action alternatives would increase the risk of introducing and spreading invasive plant species, compared to the No-action Alternative. The relative risk of is compared between alternatives using miles of new system and temporary road constructed or reconstructed.

All action alternatives will implement the following design criteria:

- Off-road equipment will be cleaned to remove seeds, vegetative matter and other debris according to the timber sale contract to help reduce the spread of invasive plant species.
- Erosion control measures will use materials that comply with TNF standard seed mixture (FSM 2080 TNF supplement R10 2000-2007-1). Revegetation seed mixtures will be compliant with Tongass National Forest guidelines for revegetation (TNF 2006).
- Control any new infestation of high-priority invasive plants according to FSM 2080 – R10 TNF – 2000-2007-1, Noxious Weed Management.

Alternative A, No Action, would not have direct or indirect effects on invasive plants. Human-caused spread or introduction of invasive plants would continue on a limited scale by the public via motorized uses or hiking on the existing roads.

Of the action alternatives, **Alternative C** poses the greatest risk, with the most (30.9 miles) miles of road construction and reconstruction proposed.

Alternatives B and D would result in a lesser risk with 13.8 and 10.6 miles of road construction and reconstruction.

Alternatives E and F each proposes only 6.7 miles of new road and reconstructed roads. Therefore, these alternatives pose the least risk among the action alternatives for the introduction and spread of invasive plants.

For all action alternatives, implementation of the design elements prescribed will limit the spread and introduction of invasive plant species.

Cumulative Effects

Currently all invasive plant species in the project area occur along roads and in developed areas. Increasing recreational use on the Anita Bay road system by hunters with motorized vehicles will continue to be a vector for introduction and spread of invasive plants along the road corridors. Permitted recreational use in the backcountry has the potential to introduce invasive plants into pristine high-elevation habitats.

Additional road building from the Navy project could increase the risk of infestation. While project mitigation measures, BMPs, and road contract provisions (see below) would limit the potential for additional infestation, new roads would offer increased access to recreational users, who may transport seed or plant material into the area. All roads constructed for this project will be closed after timber sale activities are completed, reducing the amount of expected recreational use.

Mitigation

- Off-road equipment will be cleaned to remove seeds, vegetative matter and other debris according to the timber sale contract to help reduce the spread of invasive plant species.

Use of hay or straw bales for erosion control will not be allowed. Materials that comply with TNF standard seed mixture (FSM 2080 TNF supplement R10 2000-2007-1) will be used for erosion control where necessary.

Monitoring

Prior to closing or storing NFS roads that were newly constructed for this project, the roads will be surveyed for high-priority invasive plants. If any new infestations are detected, a treatment strategy will be developed and implemented.

Environmental Justice

Introduction

This analysis primarily centers on the consumption patterns of wild foods and subsistence resources in the project area by minority and low-income populations and, how the project may affect those patterns.

Executive Order 12898 requires Federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States. The Navy Timber Sale is a Federal action that has potential environmental effects. This section considers whether there is a disproportionately high and adverse effect from any of the alternatives on low-income and minority populations in communities near the project area, and tiers to the analyses presented in the Navy Subsistence, Wildlife, Fisheries, and Heritage Reports.

The Council on Environmental Quality (CEQ) issued guidance on analyzing effects on environmental justice under NEPA in December 1997. This guidance clarified that such analyses should recognize the interrelationships between cultural, social, occupational, historical, and economic factors that may amplify the environmental impacts. For example, subsistence in Alaska Native communities is not only important economically, it is also important for reasons of tradition and culture; consequently, impacts on subsistence resource use also impact the social and cultural lives of residents. The CEQ guidance clarified that the identification of disproportionate effects does not preclude the agency from going forward with the proposed action, but should heighten attention to project alternatives, mitigation and monitoring needs, and the preferences of the affected communities (CEQ 1997, p. 10).

Analyzing Information and Effects

Executive Order 12898, Departmental Regulation 5600-2, and the December 1997 direction from the Council on Environmental Quality was reviewed as a starting point for the analysis on environmental justice for the Navy EIS. Section 4-4 of the Executive Order directs Federal agencies to collect, maintain, and analyze information on the consumption patterns of communities who principally rely on fish and/or wildlife for subsistence. No minority or low-income populations physically live within the Navy project area, but they do exist 10 to 20 miles away, in the communities of Wrangell and Coffman Cove.

A variety of data, representing the most recently available information, was referenced for this analysis. This data includes 2000 U.S. Census Bureau demographic information for the communities of Coffman Cove and Wrangell, technical papers, Navy Timber Sale project resource reports, State websites, and meetings with tribal governments. Data referenced is listed in more detail in the environmental justice resource report.

Public Participation

Section 5-5 of the Executive Order directs Federal agencies to conduct effective public participation with low-income and minority communities. The public participation process involved public scoping through notifications in local papers, agency public

websites, written letters to individuals, agencies, governments, and Native corporations, and notices in the Federal Register. In addition, the project was presented to the local tribal governments before public scoping. Additional meetings with local tribal governments, their committees, and other suggested tribal contacts have been made and will continue for this project. The public participation is detailed in Chapter 1 and the environmental justice resource report.

Analysis Area

The analysis area includes wildlife analysis area 1901 (WAA 1901) and the adjacent waters. This is a logical area for analysis; since, WAA 1901 contains all of the watersheds in which consumptive uses could be affected by the proposed timber harvest activities. The affected environments are those consumptive use patterns by the minority or low-income populations. The two adjacent communities with minority or low-income populations are Coffman Cove and Wrangell. The Etolin Island Analysis Area is part of the community use area for both communities (2008 Forest Plan, Vol. 1, pgs. 3-582, 706). The analysis area is not connected by road to the communities of Wrangell or Coffman Cove. Access to the analysis area is by boat, floatplane, or helicopter. The use of helicopter or floatplane is not typically associated with the subsistence use of wild foods in Southeast Alaska, due to the high costs of that type of transportation.

Summary of Effects

There may be minor changes to the consumption patterns of resource use by minority and low-income populations within the Navy analysis area. Adjacent subsistence uses and consumptive use patterns are not likely to be affected by timber harvest activities within the Navy project area. None of the alternatives will have a disproportionately high and adverse effect on the health or well-being of the minority or low-income populations that use the Navy project area. Any changes in consumption patterns and wild food resources would be equally applicable to the general population.

Affected Environment

Demographic and Economic Conditions

Coffman Cove Community Profile

Coffman Cove is located on northeast Prince of Wales Island. Settlement of Coffman Cove began in 1956 with development of a logging camp. A road connecting Coffman Cove to the larger community of Craig was built in the 1980s. The logging industry and local school system provide the majority of employment. Oyster farming and commercial fishing also occur in the area.

According to 2000 U.S. Census Bureau data, Coffman Cove had a white population of 87.4 percent. The remaining 12.6 percent of the population is a mixture of minorities, of which only 2.5 percent are American Indian and Alaska Native.

Coffman Cove has 6.7 percent of families in poverty status, the same as the State average. The Alaska statewide average unemployment rate is 6.1 percent. Coffman Cove is slightly higher, at 7.8 percent, than the Statewide average for unemployment.

Wrangell Community Profile

Wrangell is located on the north end of Wrangell Island, near the mouth of the Stikine River, a historic trade route to the Canadian interior. First, a Tlingit settlement, Wrangell later became an exchange and supply center for foreign fur traders and gold prospectors. Today, the Wrangell economy is primarily based on commercial fishing, fish processing, and the timber industry.

According to 2000 U.S. Census Bureau data, Wrangell had a white population of 73.5 percent. Of the remaining 27.5 percent minority population, 15.5 percent are American Indian and Alaska Native.

Wrangell has 7.3 percent of families in poverty status, slightly above the State average of 6.7 percent. Wrangell's unemployment rate is 5.8 percent, slightly below the Alaska statewide average unemployment rate of 6.1 percent.

Consumption Use Patterns

Etolin Island is used mainly by the residents of both Coffman Cove and Wrangell. The western area of the island is used by Coffman Cove residents and the eastern area by Wrangell residents (Forest Plan, Vol. 1, pgs. 3-582, 706). Both communities use the island and surrounding waters for day-to-day work, recreation, and subsistence activities. The Wrangell Harvest Study demonstrates that most Wrangell residents harvest wild food, depending on it for most of their meat and fish. The importance of the wild resource harvest goes beyond nutritional need. A quality of life revolves around seasonal harvests. Household interdependency, expressed by sharing and pride in self-sufficiency, remains central to the majority of Wrangell households. Coffman Cove is an undeveloped, Alaska rural community and continues traditional fishing and hunting as ways of making a living. Food production is an economic enterprise in rural areas. Most rural communities in Alaska are dependent on fishing and hunting to produce food for local consumption.

Wrangell's reported 1987 harvest of wild foods was 158.3 lbs per person (Cohen, 1989). Coffman Cove's 1987 harvest was 212 lbs. per person (Wolfe, 2004). Both of these harvest amounts are equal to or greater than 100 percent of the dietary allowance of protein. These are substantial harvests of wild foods by both Alaska Native and non-Native households. The mean household harvests of wild resources in 1987 are similar between Alaska Native households and non-Native households, except for seal, which is harvested only by Alaska Native households. However, the 1987 Wrangell Study reports differences in the quantity of harvest by species between non-Native and Native households. Natives harvest more deer, moose, and seal than non-Natives. Since deer is the only resource the proposed harvest activities are likely to be affected by this projct (see Subsistence section), this section focuses primarily on the impacts to the abundance of, access to, and competition for deer, primarily by Wrangell residents.

No unique or rare wild foods or subsistence materials were identified within the Navy environmental justice analysis area. The types of materials harvested in the analysis area are found in numerous other locations, many of them in closer proximity to minority or low-income populations.

Uses and Use Areas

The Forest Plan displays maps of traditional household hunting areas and the percent of deer harvest by ADF&G wildlife analysis areas (WAA). Table 3.23.65 (Forest Plan, Vol. I, pg. 3-707) shows Wrangell residents obtain around 5.4 percent of their average annual deer harvest from WAA 1901, which includes all of the Navy environmental justice analysis area. Although the western portion of Etolin Island is

shown to be part of Coffman Cove's community use area (Forest Plan, Vol. 1, pg. 3-582), deer harvest by Coffman Cove residents occurs almost entirely on Prince of Wales Island. Table 3.23.12 (Forest Plan, Vol. I, pg. 3-584) shows that 75 percent of deer harvest by Coffman Cove residents is from other WAAs.

Timber harvest and road construction have occurred in the analysis area since the 1950s. Patterns of access to wild foods can change because of these timber management-related activities. The presence of docks at Anita Bay LTF allows safe moorage and improved access to the road system that was not present in the past. The open roads in the analysis area now provide greater access to inland food sources than boat and beach access alone previously provided. This creates more competition for available wild foods in the form of sport hunting, fishing, crabbing and shrimping. While there could be increased competition from non-minority/low-income users, the improved access provides additional opportunity for all users through motorized transportation.

Environmental Effects

Direct and Indirect Effects

The distribution and abundance of, access to, or competition for aquatic, marine, and vegetative (berries) subsistence resources are not likely to have a disproportionately high and adverse effect on the health or the environment of minority or low-income populations in any of the alternatives. The Navy project area is not heavily used for berry picking because there are no communities on the Anita Bay road system. Aquatic, marine, and vegetative (berries) subsistence resources are not likely to be significantly impacted by project-related activities.

Deer

Declines in deer habitat are predictable and will occur under all action alternatives in areas where timber is harvested. However, the effects in population are not so predictable. Some localized shifts in distribution could occur as result of the proposed timber harvest, but this is not expected to change the overall distribution within WAA 1901 or cause mass migration of deer to adjacent WAAs.

Road access would improve as a result of roads associated with Alternatives B, C, D and E. New roads, open or closed, will increase opportunities for all hunters. Any declines in deer abundance resulting from reduced habitat and increased access to deer by both rural and non-rural hunters could lead to increased competition for deer. If demand exceeds 20 percent of habitat capability, harvest of deer by hunters may be directly or indirectly restricted. A demand of 10 percent is sustainable and provides a reasonable high-level of hunter success (Flynn and Suring 1993). Even under Alternatives B and C, hunter demand (at year 2033) is not expected to exceed 2.4 percent in WAA 1901 (Table 3-29, Subsistence section of this chapter).

Deer harvest by Wrangell residents is spread over many WAAs. WAA 1901 only accounts for 7.2 percent of the deer harvested by Wrangell residents (Forest Plan 3-707) and is not listed for Coffman Cove residents (Forest Plan 3-584). The average annual deer harvest for all hunters from WAA 1901 for 1997-2005 was 39 deer, with 1997-98 being a high harvest year of 78 deer. Assuming hunter demand does not increase above 78 deer per year, and that no further timber harvest or substantial habitat alteration occur in the next 26 years in WAA 1901, none of the alternatives would result in hunter demand exceeding 10 percent of habitat capability. This

analysis would imply no minority or low-income Wrangell resident would likely have a disproportionately high and adverse effect on their hunt demand and success from any of the alternatives.

Cumulative Effects

This cumulative effects analysis considers past, present and reasonably foreseeable effects in the analysis area that may cause a disproportionately high and adverse effect on the minority and low-income populations of Coffman Cove and Wrangell. There are no foreseeable projects (private or federal) in the analysis area that would cause a disproportionately high and adverse human health or environmental effect on any minority or low-income population. There are no significant effects on these resources, the minority populations, or income groups that use them. The Navy subsistence report found that the proposed actions would not result in a significant possibility of a significant restriction on subsistence resources and uses except for deer.

High fuel prices may have an adverse affect on the cost of obtaining these subsistence resources in the future, making this area less desireable for subsistence use. This cost may cause less use of this area and more use of areas closer to the affected minority or low-income communities. However, the opposite may be true, since purchased food also becomes higher in price due to production and shipping costs.

Geology

Introduction

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 limestone and marble in Southeast Alaska. Forest cave and karst resources management direction is based on the Federal Cave Resources Protection Act (FCRPA, 1988) and the Tongass Land Management Plan (Forest Plan, 2008). FCRPA defines "a significant cave as follows: "….determined to have biotic, cultural mineralogical, paleontologic, geologic, hydrologic, and/or other resources that have important values. Preliminary geology/karst mapping was done along the existing roads in 1999 (report in District files). Additional information was collected while doing stream surveys, routine road, and unit surveys.

Karst vulnerability was assessed using the three categories described in the Forest Plan (Appendix H).

Low-vulnerability karstlands: These are lands where resource damage threats associated with land management activities are not likely to affect the karst systems. The low vulnerability is generally attributed to small blocks of carbonate bedrock, and the areas have little or no epikarst (karst surface features).

Moderate-vulnerability karstlands: These are lands where management activities could affect the karst resources. The epikarst in these areas is moderate- to well-developed and is sometimes visible at the surface. The density of surface features is low enough that individual feature protection will protect the karst resources.

High-vulnerability karstlands: These areas have well-developed karst features including collapsed karst features, caves, loosing streams and resurgences (discrete springs, flowing from bedrock). Management activities on these karst lands could move organics, sediments, and debris down into the karst hydrologic systems. High-vulnerability karst lands can include the non-carbonate uplands that contribute surface waters to the karst system. These lands are removed from the timber base, and no roads are constructed across them unless there is no other alternative feasible route.

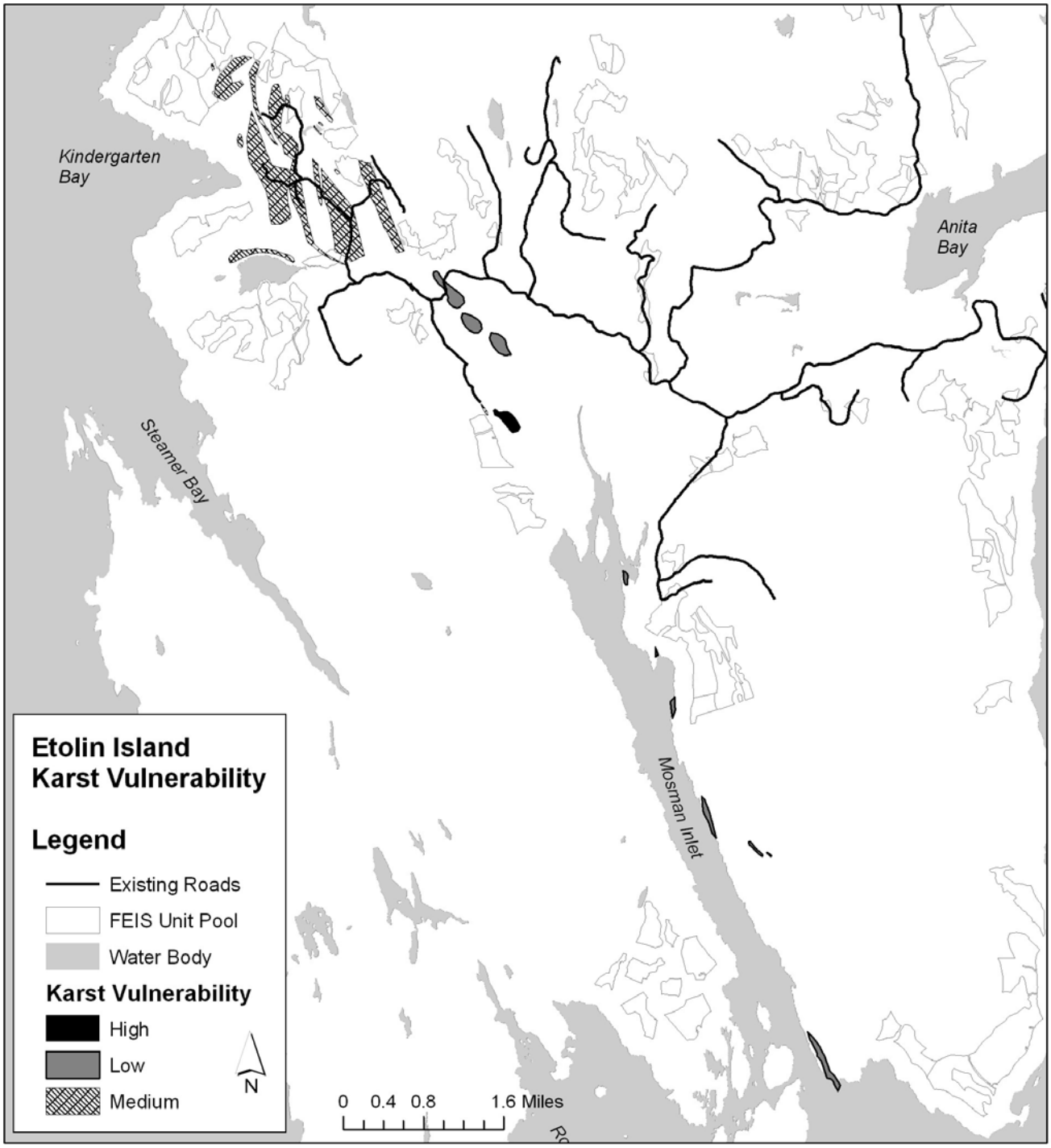
Analysis Area

The analysis area for direct and indirect effects geology resources of interest includes the harvest areas and proposed road corridors (both temporary and NFS roads). The analysis area for cumulative effects is the project area. The project area was maximized to insure all management activities that could affect the karst hydrologic system was included.

Summary of Effects

There will be no direct effects on karst resources resulting from implementation of any of the alternatives. Buffers protecting karst resources near Unit 49 and Unit 101 are in an area with a high risk of windthrow, therefore, there is a risk that buffers may not remain intact and some sediment may enter the karst waters. Additional trees will be left along these buffers, making them more windfirm.

Figure 3-9
Karst Vulnerability in the Navy Timber Sale Project Area



Source: J. Llanos; GIS

Affected Environment

A discontinuous band of marble extends from Marble Point on south end of the project area to north of Kindergarten Bay. In general, lands north of the head of Mosman Inlet were found to have better karst development than lands located along the east side of Mosman Inlet. The marble bedrock lies in an interbedded[3] sequence of greywacke, banded siltstone, and phyllite[4] having a strike north to slightly northwest, dipping to the east from 17 to 75 degrees. The marble is interspersed with volcanic intrusions and is masked in places by glacial till deposits. The karst development is variable, depending on the attitude of the bedding, the nature of the contact with the interbedded units, and the presence or lack of glacial till. In the project area, we found well-developed epikarst, with numerous sinkholes, loosing streams, stream resurgence and a cave. The size of the karst systems is small in comparison to those found on Prince of Wales Island.

Low Vulnerability

A "low vulnerability" was assigned to all carbonate rocks on the east side of Mosman Inlet, south of the head of Mosman Inlet.

High Vulnerability

High-vulnerability karst was found near the headwaters of Mirkwood Creek (see Figure 3-16 in the Watersheds and Fisheries section of this chapter for stream location). Epikarst features are 3 to 8 feet deep. Karst drainage systems have developed in the marble. A Class IV stream drains the wetlands east of Unit 49, flowing into a sinkhole at the western edge of the marble. The exact resurgence location was not located; it appears that there are a number of springs where the water resurfaces.

Moderate Vulnerability

The remainder of the karst was categorized as "moderate vulnerability". The area north of Kindergarten Lake has the largest marble exposure (approximately 1,500 acres in size). It appears to have internal drainage that supplies water to the muskegs that lie to the east. A number of rare plants were found in the wetlands in this area. Much of the commercial timber in this area has already been harvested.

Squirrel Cave was found by loggers in a harvest unit in 1992, and mapped by members of the Tongass Cave Project. Reports are on files at the Wrangell District Office. Location information is exempt from FOIA. Member of the Tongass Cave Project did a cursory survey of the surrounding area and found no areas with a high likelihood of having significant caves (Kevin Allred, personal communication).

A small area along the northern boundary of proposed Unit 101 is underlain by marble. The stream on the northern boundary of the unit is a resurgence stream,

---

[3] Interbedded means that the rock is lying between beds of strata of different rock or mineral.

[4] Phyllite is a green, gray, or red metamorphic rock similar to slate but often havinga a wavy surface and a distinctive luster imparted by the prescence of mica.

surfacing at the contact of the marble and phyllite bedrock, and is then partially lost before crossing Road 6545. Below the 6545 road there are numerous small upwelling areas. One area in particular was a deep clear water pool in the muskeg. Two rare orchids were found in the adjacent wetlands.

Marble was located in the western corner of Unit 105. Southwest of Unit 105, marble was found on the hillside north of Twin Lakes (west of Unit 104). A small stream (less than 1 ft) was found that flows into a sinkhole. Upslope, another block of marble was located on the ridge top above Unit 106.

The marble found near Units 109 and 110 was the northwestern-most carbonate rock located. A small block of marble (<.25 acres) was located along the proposed 51009 road line; it contributes waters to the headwaters of the stream in Marble Canyon. A deeply incised marble canyon borders the eastern side of Unit 109; no carbonate bedrock was located on the west side of Marble Canyon.

Road Locations

Much of the existing roads 6545 and 6538 are located on carbonate bedrock. There are no identified impacts on karst resources associated with these roads. The wetlands west of the 6545 road have small upwelling springs downslope of the road. The stream on the north side of Unit 101 is only surface water crossing the road in this area. It appears that some of the water is lost before it goes through the culvert and resurfaces in the wetlands below.

Environmental Consequences

Direct and Indirect Effects

Low Vulnerability

No harvest activities are near low-vulnerability karst along Mosman Inlet.

High Vulnerability

The western fork of Mirkwood Creek isolates any management-related disturbance that may be associated with Units 49, 50, and 51 and road construction from the karst area. A windfirm Class II stream buffer will be used to protect the stream. However, this area is buffeted by high winds, so maintaining standing trees will be a challenge.

The 51421 road was rerouted to the east to avoid crossing a small band of high-vulnerability karst near Unit 49. The road will cross a small resurgent stream emanating from the karst.

Moderate Vulnerability

The road accessing Unit 105 will be located to the east of the karst area. Cable harvest of the unit will minimize soil disturbance and risk of contributing sediment to karst system.

It is not likely that the boundary of Unit 106 will reach upslope to where marble was encountered, due to steep slopes.

The Draft EIS included proposed harvest on karst in Unit 109. These areas have been dropped due to karst resource concerns, steep slopes, and harvest opening size greater than 100 acres. The 51009 road is located along southern edge of marble between mile point 1.6 and mile point 2.0.

Road Locations

The exact location of some of the road alignment near low and moderate-vulnerability karst has yet to be determined. Final road alignment on karst landscapes must be approved by the Forest geologist or their representative.

Additional marble outcrops may be located during project layout. If they are encountered, a vulnerability assessment will be made. Generally, carbonate rock can be recognized by the plant growth in the area. Plants that grow in nutrient-rich calcareous soil, e.g., green spleenwort, mountain bladder fern, maiden hair fern and common harebell are a good indicator of carbonate bedrock.

Effects by Alternative

None of the action alternatives will have an effect on known caves. None of the alternatives proposes harvest that would affect the stand surrounding Squirrel Cave.

Alternatives C and D propose harvest of Unit 101. There is a risk that blowdown of timber adjacent to the Class IV stream on the northeast side of the unit may contribute sediment to the stream. Sediment contribution could affect subsurface flows and water chemistry. Transport of the sediment to wetlands down slope could alter the wetland habitat where rare plants are located. Retention of a windfirm buffer along the stream will decrease the risk of interrupting subsurface hydrology and affecting water chemistry.

All of the action alternatives propose to construct a portion of road 51421 accessing Unit 49. The road will be located to avoid the high-vulnerability karst. No timber harvest will occur on the high-vulnerability karst, and additional retention of upslope trees will minimize risk of affecting the area contributing to the resurgent stream. Rock pits adjacent to, or on, karst lands will be approved by the Forest karst specialist prior to development as described above.

All of the action alternatives propose to construct a portion of the 51009 road. Alternatives B and C will build the 51009 road up Marble Canyon. There were no surface features indicating low-vulnerability karst along the proposed road line; however, the stream appears to be influenced by karst waters.

Implementation of mitigation measures for road location and rock pit development described above will reduce or eliminate impacts to karst from road construction.

Cumulative Effects

The analysis area for cumulative effects for the karst resource is the project area.

Road construction, rock pit development, and timber harvest have occurred in the past on karst lands in the project area. A buffer has been retained around the only known cave in the project area, retaining natural, unmanaged conditions around the cave. Past timber harvest and rockpit development, may have affected karst systems by contributing sediment or interrupting hydrologic systems. Implementation of current standards and guidelines is expected to minimize further impacts.

None of the reasonably foreseeable actions listed at the beginning of this chapter (see “Analyzing Effects” in the Introduction) are expected to affect karst resources.

Heritage Resources

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 "historic properties" - 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 (ACHP)(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 ACHP, Indian tribes, and other parties with an interest in the effects of the undertaking on historic properties, commencing at the early stages of project planning. Some of the goals of consultation are 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 Wrangell Cooperative Association (WCA), the tribal group that is culturally affiliated with the project area. Forest Service archaeologists and other members of the team met with WCA concerning the planned project and supplied them with a copy of the heritage resource report entitled *Cultural Resource Survey in the Navy Timber Sale Project Area, Etolin Island, Alaska* for review and comment (Esposito and Smith 2007). Copies of the report were also sent to Central Council Tlingit and Haida Tribes of Alaska, Kake Tribal Corporation, the Organized Village of Kake, the Petersburg Indian Association, and Sealaska Corporation.

To ensure that the procedural requirements of 36 CFR 800 were met, a cultural resource investigation of the Navy project area was conducted. In accordance with the Programmatic Agreement (2002) among the Forest Service Alaska Region, the ACHP, and the SHPO, a resource report was submitted under 36 CFR 800 regulations implementing Section 106 of the NHPA. The SHPO concurred with the Forest Service finding of No Historic Properties Affected for this project.

Analysis and Inventory Methodology

The heritage resource evaluation of the Navy Timber Sale began with a literature search of past cultural resource surveys in and around the project area. The Forest Service consulted with the Wrangell Cooperative Association (WCA), and reviewed various historical and ethnographic accounts: Alaska Heritage Resource Survey (AHRS) listings, Petersburg/Wrangell Heritage files and atlases, special use files, GIS archaeological site and survey covers, and the Tongass Site Database.

Over the past several decades, Forest Service archaeologists have conducted 23 archaeological surveys on Etolin Island, 14 of which were located in the project area. Approximately 6,150 acres representing 2.8 percent of the island landmass has

received some sort of archaeological examination. A total of approximately 2,110 acres, representing 2.8 percent of the project area, have been surveyed.

In addition to the background research, the Forest Service conducted a pedestrian survey of 670 acres of various types of terrain in search of undiscovered sites and other heritage resources. The Forest Service surveyed a sample of proposed timber harvest units and new road locations, paying special attention to fish streams and cedar stands, resources used by the Tlingit people. Survey methods are based on a probability model developed over the past several decades. It is further described in the Programmatic Agreement (2002).

Analysis Area

The cumulative effects analysis area coincides with the project area boundaries and the Area of Potential Effect (APE). The project's 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 (Federal Register 36 CFR 800.2(c)).

Summary of Effects

Forest Service records show there are 27 sites in the project area, none of which would be affected by the planned activities.

Affected Environment

According to oral tradition and various historical accounts, the Tlingit are the dominant native group of Southeast Alaska. The Navy project area lies within the traditional territory of the Stikine Tlingit, who occupied a large territory, extending up the Stikine River as far as Telegraph Creek, and encompassing the mainland shore from Union Bay on the Cleveland Peninsula north to Cape Fanshaw. The territory reaches west to include portions of Kupreanof and Prince of Wales Islands, and all of Etolin, Mitkof, Wrangell, and Zarembo Islands.

Etolin Island archaeological sites represent the typical array of site types in central Southeast Alaska. These include both prehistoric and historic period sites, some of which may date to several thousand years. Site types include prehistoric period camps, villages, forts, fish traps and weirs, petroglyphs, an alpine rock cairn, a canoe, and a garden. Historic period sites include cabins, canneries, and a hatchery.

There are 27 AHRS sites within the project area boundaries. Five of these sites were discovered during cultural resource surveys for this project (Table 3-17), while the 22 other sites were discovered through previous surveys. These five sites have been determined to be eligible for the National Register of Historic Properties.

Environmental Consequences

Direct and Indirect Effects

Nearly all of the archaeology sites in the project area are located within a protected buffer established along the beach and estuary fringe and defined in the Forest Plan Standards and Guidelines (2008 Forest Plan, pg. 4-16). All of the alternatives propose to harvest timber from inland locations, and none would encroach on the buffer zone. The Etolin Canoe site is the only site that lies outside the buffer zone; no project activities are proposed within approximately 1,900 feet of the canoe.

None of the proposed alternatives would have a direct or indirect effect upon known cultural sites in the project area. All the alternatives propose to use coastal LTFs, and

one alternative will construct a new road within the coastal buffer zone. No LTF or road construction would directly or indirectly affect known cultural sites.

Table 3-17
Sites Discovered During the Navy Project Cultural Resource Survey

USGS Quad	AHRS Number	Name	Eligibility Status	Effect
Petersburg A-2	49PET530	Navy Stone Arc	Yes	No Effect
Petersburg A-2	49PET531	Two Loons Midden	Yes	No Effect
Petersburg A-2	49PET558	Goose Midden	Yes	No Effect
Petersburg A-2	49PET573	Quiet Harbor Fish Weir	Yes	No Effect
Petersburg A-2	49PET574	Mosman Fish Weir	Yes	No Effect

Source: Tongass Site Database

Cumulative Effects

Cumulative impacts to heritage resources on the Tongass may result from natural erosion, weathering, sedimentation, and wind events, and cultural processes such as public use, commercial development, timber harvest, and road construction. Logging and road access by hunters are the primary activities that occur within the Navy project area. Most of the recorded cultural sites are concentrated near the marine shore; increased visitation and expanded use of the beach and estuary fringe could have a cumulative effect on heritage resources in the form of vandalism, looting, or inadvertent damage, such as ground compaction from trampling and/or camping. There are no foreseeable cumulative effects to historic properties associated with proposed activities with project implementation. Additional foreseeable activities that may take place in the project area vicinity include salvage timber harvest projects; these projects would occur adjacent to existing roads and would not cause effects on historic properties or known sites.

Intensive cultural resource surveys and site monitoring have been implemented since the 1980s. The current archaeological research and survey designs are based on the results of this work, as well as, more modern methodology and technology. These methods are designed to preserve and protect significant sites and provide information that will help guide future research and resource management. In addition, continued public education by the Forest Service to increase awareness concerning cultural resources and site stewardship assists the agency in effectively managing the region's heritage sites.

Recreation

Introduction

This section discusses how the alternatives proposed for the Navy Timber Sale may affect the recreational use and opportunities on Etolin Island. The discussion focuses on four main elements:

1) Recreation Opportunity Spectrum (ROS) which is an inventory model used to map and describe the expected type of recreation use based on the degree of development the recreation user encounters,
2) Inventoried Recreation Places, which discusses direct and indirect effects to areas within the project area that are known to attract recreation use,
3) Current Recreation Uses, which describes the known uses occurring within the project area and the likely changes to them that may be a result of implementing the alternatives, and
4) Non-Recreation Land Uses, which focuses on special use permit holders within the project area and any anticipated impacts to their authorized activities.

Analysis Area

The Navy project area is the analysis area for direct and indirect effects to recreation, as the alternatives are limited to proposing changes only within the project area. Direct and indirect effects for recreation uses are, by their nature, dictated by the proximity to an area of interest. For cumulative effects, the analysis area includes all of Etolin Island, as most people do not make the distinction between Wilderness and non-Wilderness areas, and see the island as a whole.

Summary of Effects

The alternatives in the Navy project propose various levels of development, with some having little overall effect to the existing recreation resource. Others propose development of new areas that would provide new recreation opportunities, while potentially discouraging use by recreation users who prefer that areas remain in an undeveloped state. Within the Navy project area, recreation users are accustomed to recreating within the landscape of a working forest and expect a degree of development to be evident, especially along existing road systems. Additional harvest at any level will necessarily expand the development, though making a judgment on how that is perceived can be difficult because forest users have a wide range of values and expectations. Generally, the best way to rate alternatives is to examine the overall degree of change from the existing condition that each would result in. Alternative A would result in no change to existing conditions. With the action alternatives, impacts vary by area, but overall, Alternative C results in the greatest degree of change from existing condition, followed by Alternative B, Alternative E, Alternative D, and Alternative F, in that order.

Recreation Opportunity Spectrum

Affected Environment

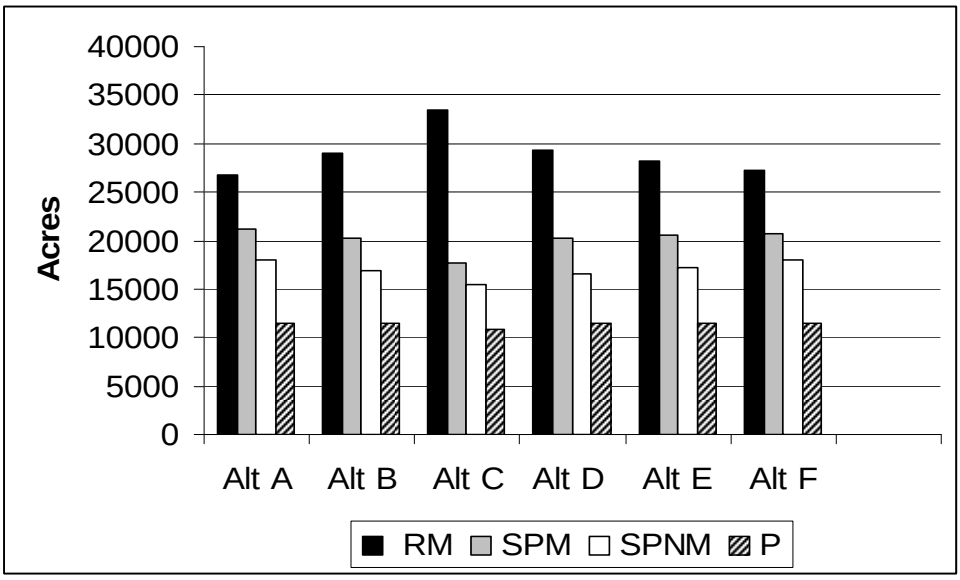
Recreation Opportunity Spectrum (ROS) is a system for planning and managing recreation resources that categorize recreation opportunities into seven classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs based on the extent to which the natural environment has been modified, types of facilities provided, the degree of outdoor skills needed to enjoy the area, and the relative density of recreation use. In timber planning projects, roads tend to have the most influence in changing the setting from a natural setting, to a developed one. Harvest units can have an affect as well, depending on the prescription used. The seven classes (from most natural to least natural) are Primitive, Semi-Primitive Non-motorized, Semi-Primitive Motorized, Roaded Natural, Roaded Modified, Rural, and Urban. Detailed description of these classes can be found in Appendix I of the Forest Plan.

In the Navy project area, there are four ROS classes present: Primitive (P), Semi-Primitive Non-motorized (SPNM), Semi-Primitive Motorized (SPM), and Roaded Modified (RM). They are displayed as Alternative A (Existing Condition) in Figure 3-10 below.

Environmental Effects

Figure 3-10 displays the acres that would be inventoried in each ROS category as a result of implementing the proposed alternatives.

Figure 3-10
ROS Acres by Alternative for the Navy Project Area



RM – Roaded Modified ROS Class
SPM – Semi-Primitive Motorized ROS Class
SPNM – Semi-Primitive, Non-Motorized ROS Class
P – Primitive ROS Class
Source: GIS: j:fsfiles/office/gis/navy\rec\Etolin_rec.mdb\rec_polys_ed

The main effect to the ROS is the conversion of acres from a Semi-primitive setting (either motorized or non-motorized) to a Roaded setting. The acres inventoried in the Primitive ROS class vary slightly between alternatives. The major difference between the alternatives is the conversion of currently inventoried “Semi-primitive” acres to a “Roaded” setting.

Alternative C has the most potential to affect the ROS inventory, mostly due to entering the Cooney Cove area with a road system. The overall percentage of inventoried acres in a Roaded setting would increase by 8 percent (from 35 percent to 43 percent) for the Navy project area. On a project area-wide basis, Alternative C would change the inherent character of the area the most, from a recreation user’s perspective.

Alternatives B, D, and E are very similar in their effect to the ROS inventory, with Alternative D increasing the percentage of acres inventoried in the Roaded Modified ROS class by 3 percent, Alternative B by 2 percent, and Alternative E by 1 percent.

Alternative F would have the least impact to the ROS inventory. Although it proposes just under 500 acres added to the Roaded Modified ROS class, this does not result in a change in percentage for the project area as a whole from the No-action Alternative (Alternative A).

Inventoried Recreation Places

Affected Environment

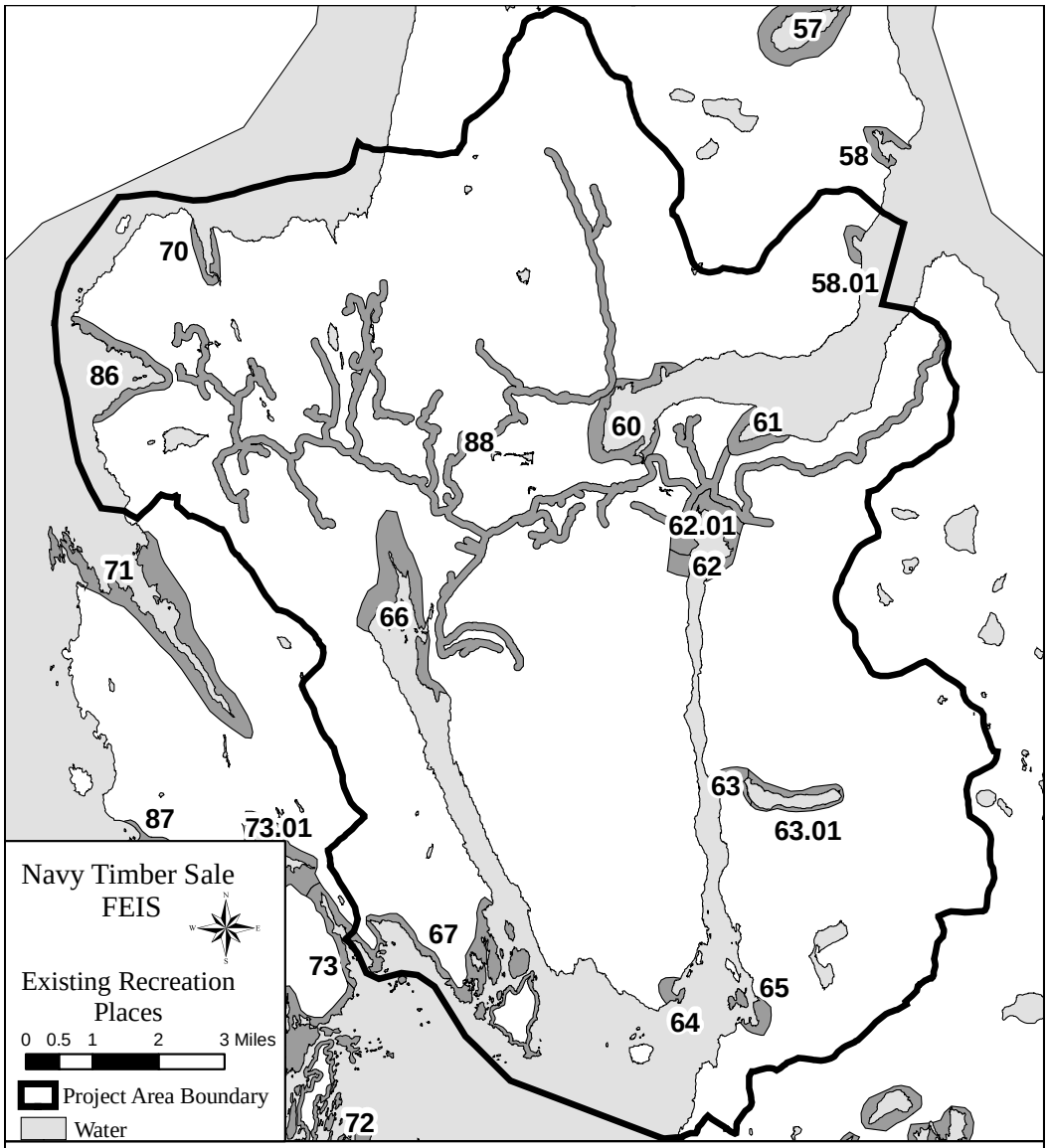
There are 13 inventoried recreation places, and portions of an additional two inventoried recreation places within the Navy project area. Table 3-18 describes and Figure 3-11 shows the inventoried recreation places in and near the Navy project area.

Table 3-18
Navy Project Area Inventoried Recreation Places and Associated Activities

Recreation Place	Major Recreation Activities Associated with Rec Place
Honker Hole (58.01)	Anchorage, big game hunting, waterfowl hunting
Head of Anita Bay (60)	Stream fishing, big game hunting, waterfowl hunting
Starfish Cove (61)	Boating site, dock, anchorage, access to Anita Bay Road System
Head of Burnett Inlet (62), and Head of Burnett Inlet Roads (62.01)	Anchorage, boating, big game hunting, waterfowl hunting, scenery, cross-country access to road system from inlet
Burnett Hatchery (63)	Anchorage (dock use with permission), boating, access to dispersed hiking
Burnett Lake (63.01)	Hiking, big game hunting, wildlife viewing, lake fishing
Cannery Cove (64)	Anchorage, boating, big game hunting, wildlife viewing, dispersed hiking
Navy Creek (65)	Anchorage, scenery, wildlife viewing, dispersed hiking to lake setting, stream fishing, big game hunting
Mosman Inlet (66)	Anchorage, boating, scenery, stream fishing, waterfowl hunting, big game hunting, beachcombing, wildlife viewing
Quiet Harbor (70)	Anchorage, saltwater fishing, boating, big game hunting
Kindergarten Bay (86)	Anchorage, saltwater fishing, boating, big game hunting
Anita Bay Road System (88)	Approximately 50 miles of drivable road providing access to a variety of dispersed recreation activities including hunting, hiking, wildlife viewing, stream fishing, and viewing scenery
Cooney Cove/Streets Creek (67 & 73)	Anchorage, beachcombing, camping, big game hunting

Source: D. Galla, Wrangell Ranger District

Figure 3-11
Inventoried Recreation Places In and Near the Navy Project Area



57 - Kunk Creek and Lake	63 - Burnett Hatchery	71 - Steamer Bay
58 - Dog Salmon	63.01 - Burnett Lake	72 - Rocky Bay
58.01 - Honker Hole	64 - Cannery Cove	73 - Streets Creek
60 - Head of Anita Bay	65 - Navy Creek	73.01 - Streets Lake
61 - Starfish Cove	66 - Head of Mosmon Inlet	86 - Kindergarten Bay
62 - Head of Burnett Inlet	67 - Cooney Cove	87 - Johnson Cove
62.01 - Head Burnett Inlet next to roads	70 - Quiet Harbor	88 - Anita Bay Road System

Source: GIS

Environmental Effects

Direct Effects to Inventoried Recreation Places

Head of Anita Bay

The Head of Anita Bay recreation place is located mostly within the beach buffer, with none of the action alternatives proposing harvest within the inventoried recreation place. All action alternatives propose harvest along Road 51540, adjacent to the northwest boundary of the recreation place. In general, logging activities will have a direct impact to the recreation place, as all action alternatives will increase traffic at the Starfish Cove LTF and within the bay as a whole. Noise from nearby logging activities and congestion from operations near Starfish Cove will impact use of this recreation place during the life of the sale. Once active logging ceases, the use of this recreation place will return to pre-sale conditions.

Starfish Cove

The Starfish Cove recreation place is located in the beach buffer, with none of the alternatives proposing harvest within the recreation place. All of the action alternatives propose harvest that would require the use of this area for logging operations during the life of the sale. Activities in Starfish Cove associated with an ongoing timber sale are likely to discourage recreation use temporarily, as most would elect to avoid the noise, traffic, and congestion associated with moving logs through an LTF. After the sale is complete, the Starfish Cove recreation place would continue to serve as an access point to the Anita Bay road system in much the same way it currently does.

Anita Bay Road System

All of the action alternatives propose road construction that will increase the amount of roads to this recreation place. New roadbeds, whether open to motorized vehicles or not, provide a surface for a variety of recreation uses, from hiking to driving. The future management of roads on Etolin Island will be implemented according to the Wrangell Ranger District ATM Environmental Assessment (EA) decision.

Table 3-19 displays the amount of National Forest System road and temporary road that would be added to the Anita Bay road system with the different alternatives proposed in the Navy project. The addition of any road is a direct effect because it results in more miles of road for driving opportunities along the Anita Bay road system. The amount of road added is not likely to change the number of people using this road system, whether the segment is used for motorized access or for non-motorized access, as the additions are limited to already roaded areas and do not really open up access to new points of interest from a recreation user's perspective.

Table 3-19
Proposed Miles of Road Added to the Anita Bay Road System (Recreation Place 88)

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
NFS Road	0	6.6	9.0	4.8	2.2	0.5
Temporary Road	0	6.3	14.7	5.4	2.3	4.0

Source: GIS

Cooney Cove/Streets Creek

Alternative C has the potential for the greatest impact to Cooney Cove/Streets Creek, of all the action alternatives. Alternative C proposes construction of an LTF and road system in a previously unroaded area at Cooney Cove. How this impact is viewed depends on a person's perspective. Alterative C would result in the creation of a new road-based recreation place, the Cooney Cove road system, with 4.0 miles of National Forest System road and 1.0 mile of temporary road. Creation of this road system would change the character of the Cooney Cove and Streets Creek recreation places over the long term by introducing opportunities for motorized, road-based recreation, and will likely displace current recreation users who prefer the existing character of the area.

Alternatives B, D, E, and F do not propose a road system or any timber harvest near the Cooney Cove or Streets Creek recreation places and none of them would result in long-term impacts to these recreation places.

Potential Direct Effects – Helicopter-to-Barge Operations

Alternative B, C, and E propose harvest, which would be yarded by helicopter to a barge location offshore. Likely locations for a barge include Cannery Cove, Mosman Inlet, Quiet Harbor, and Kindergarten Bay. Barge operations may temporarily displace users during timber harvest but the locations of barges and timing of harvest have not been determined and would be specified within the harvest contract. It is unlikely that more than one barge location would be used at a time and effects would be temporary in nature and cease once the harvest in that area is complete. Alternatives A, D, and F do not propose helicopter-to-barge operations.

Indirect Effects to Inventoried Recreation Places

Indirect effects to recreation places caused by implementation of any of the action alternatives are temporary in nature, with no lasting effects to the recreation place once the timber sale activities are completed (i.e. noise from logging traffic). Due to the different areas proposed for harvest in the alternatives, each will result in indirect effects to recreation places near the proposed activity. Table 3-20 displays which alternatives may result in indirect effects to the recreation place during the life of the timber sale.

Table 3-20
Indirect Effects to Inventoried Recreation Places

Inventoried Recreation Place	Indirect Effects					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Honker Hole (58.01)	No	No	No	No	No	No
Head of Anita Bay (60)	No	Yes	Yes	Yes	Yes	Yes
Starfish Cove (61)	No	Yes	Yes	Yes	Yes	Yes
Head of Burnett & Roads (62; 62.01)	No	Yes	Yes	Yes	Yes	Yes
Burnett Hatchery (63)	No	No	No	No	No	No
Burnett Lake (63.01)	No	No	No	No	No	No
Cannery Cove (64)	No	Yes	Yes	No	Yes	No
Navy Creek (65)	No	Yes	Yes	No	Yes	No
Mosman Inlet (66)	No	Yes	Yes	Yes	Yes	Yes
Quiet Harbor (70)	No	Yes	Yes	Yes	Yes	No
Kindergarten Bay (86)	No	Yes	Yes	No	Yes	No
Anita Bay Road System (88)	No	Yes	Yes	Yes	Yes	Yes
Cooney Cove/Streets Creek (67; 73)	No	No	Yes	No	No	No

Source: D. Galla, Wrangell Ranger District

Current Recreation Uses

Affected Environment

From 1997 through 2004, the total service days by commercial outfitter and guide use on Etolin Island ranged from a low of 10 in 2000, to a high of 171 in 2004. In 2005, there were 1,039 service days reported for the same area, largely due to camping use reported by one not-for-profit organization that began using this area. Along with other areas of the District, as part of their wilderness therapy and environmental education programs based on the operation plans for 2006 and 2007, the organization requested similar amount of service days on the Wrangell Ranger District. Although this not-for-profit organization provides a positive economic impact to the community of Wrangell due to local employment and purchasing, it is currently exempt from paying fees for use on National Forest System lands.

The majority of non-commercial recreational use on Etolin Island is associated with the hunting of big game, particularly elk and Sitka black-tail deer. Non-guided hunters

hike cross-country and travel the roads with light trucks, motorcycles, and/or ATVs in search of animals. Most deer hunters are from nearby communities, while elk hunters are selected by lottery by the ADF&G permit system, and come from different areas of the State. Most access to the road system is through developed portals at Honeymoon Creek and Starfish Cove. These sites were initially developed as LTFs for timber harvest. For elk hunting, people use floatplanes to access high-elevation lakes in the South Etolin Wilderness, stay on boats and access hunting areas by skiff and cross-country hiking, or establish a base camp at various locations.

Other recreational activities on Etolin Island include dispersed camping related to travel by personal watercraft, beachcombing, dispersed hiking along the shoreline, trapping, and berry picking along the roads in old harvest units.

Environmental Effects

Direct and Indirect Effects

The action alternatives proposed for the Navy Timber Sale would result in varying degrees of change to the character of the project area. The alternatives ranking is based on the following assumptions. The assumptions are listed in order from most likely to result in a change of the overall recreation character to least likely.

1. Introducing new road systems into previously unroaded areas has the most potential to change the way an area is used by recreation visitors, both non-commercial and commercial.

2. Extending road systems that are already in place with an established access point (usually an LTF) has potential to change the character of previously unroaded area. However, with an LTF already in place and road-based recreation already established nearby, this change is not as intrusive as a completely new road system and LTF which would change an area from semi-primitve recreation use to roaded recreation..

3. Timber harvest changes the immediate surrounding area of a recreation place, which can change the way a person feels about using the area for recreation, but as trees regenerate in the harvest units, the scenery recovers over time.

Generally, cable-yarded units are more obvious, and take longer to recover visually than helicopter-yarded units, so are considered less acceptable and likely to displace recreation users who seek a naturally appearing landscape. Recreation users who are interested in berry-picking may use these clearcuts for a short time after harvest until trees are established.

The least-intrusive harvest activity is helicopter harvest of an area without the establishment of roads. Although harvest may be visually evident for some time, the overall character of the area remains unroaded, and as harvest units recover visually, the area returns to conditions that were present prior to timber harvest.

In determining the impact of the various alternatives proposed, it becomes difficult to rate a potential impact because the recreation resource can be as much social as it is physical. For example, a new LTF and road system in a previously unroaded area would undoubtedly be a change from current conditions and would be considered an impact to the recreation resource, but is it a good change or bad? The answer depends on whom you ask. Two reasonable people who have an attachment to the specific area and a desire to use it for recreation purposes could come to very different conclusions as to whether a proposed road system is good or bad. A person who values road-based

recreation opportunities for motorized recreation activities would find this potential change “good” as it opens up new areas for exploration. A person who has accessed the area for most of their life by hiking and values the solitude and unique characteristics of the area they have discovered over time may feel that their recreation opportunities are threatened by the same proposal. It is impossible to say one view is more correct than the other is; they are just the conclusions of two people with very different perspectives.

To examine the impact of the alternatives proposed in the Navy project, it is probably best to focus on the physical changes each proposes to the area they affect. The following discussion focuses on the degree to which the various alternatives change the recreation character of the project area from its current condition.

Alternative C would result in the most overall change to the area, as it introduces a road system in Cooney Cove, and proposes the most harvest and road building, which changes the area to roaded recreation use.

Alternatives B, D, E, and F are similar in their overall potential to change the character of the Navy project area. All cable harvest proposed in these alternatives would occur on the Anita Bay road system without the need for new LTF construction or new road systems in currently unroaded areas. Of the four, Alternative B would have the most impact due to the road building associated with the harvest proposed. Alternative E would rank third due to the helicopter harvest proposed in the Quiet Harbor and Cannery Cove areas, which are untouched in the remaining alternatives. Alternatives D and F propose harvest activities well within the portion of the project area that already receives road-based, motorized recreation use; and neither propose roaded or helicopter entry into new areas, thus resulting in little change to the overall character of the Navy project area.

Special Use Authorizations

Affected Environment

The following special use permits are authorized within the Navy project area. Potential effects to these authorizations are discussed below:

Mariculture Oyster Farm, Mosman Island

The permit is issued for the purpose of operating and maintaining structures and developments necessary to support mariculture for the commercial cultivation of oysters.

Etolin Island Communications Site - Unnamed Peak North of Burnett Lake

There are two leases authorized for communication facilities at this site. This communication site is located in an area that is in the Old-growth LUD.

Burnett Hatchery – Burnett Inlet and Anita Bay

The Southern Southeast Regional Aquaculture Association, Inc. (SSRAA) holds three special use permits for facilities associated with their hatchery operation in Burnett Inlet. These authorizations include a mooring point in Anita Bay, a Federal Energy

Regulatory Commission (FERC)-licensed hydroelectric project at the outlet of Burnett Lake, and a fish hatchery and associated full-time residence in Burnett Inlet.

Environmental Effects

Mariculture Oyster Farm, Mosman Island

None of the alternatives proposes harvest or road building on Mosman Island; therefore, there would be no interference with the operation of this oyster farm. Alternative C proposes construction of a road system and LTF at Cooney Cove. Watering logs could potentially introduce debris. Should Alternative C be selected, the proposed LTF site would need to be permitted. The Forest Service would need to work closely with the permit holder to address environmental concerns associated with a new LTF at this site. Alternatives B, D, E, and F do not propose harvest or road building in Cooney Cove, and would not have an effect on the land use authorized under special use permit.

Etolin Island Communications Site - Unnamed Peak North of Burnett Lake

There are two leases authorized for communication facilities at this site. This communication site is located in an area that is in the Old-growth LUD. No road building or timber harvest is proposed near this site in any of the action alternatives. The Navy Timber Sale would have no affect on the land use authorized under special use permit.

Burnett Hatchery – Burnett Inlet and Anita Bay

The land associated with this special use permit is located within the Old-growth LUD. None of the action alternatives proposes harvest or road construction near the permit area. Alternatives B, C, and E propose harvest activities near the Burnett Hatchery, which may result in temporary impacts to the permit holder and workers at the hatchery, as the noise and activity associated with logging is likely to be noticed from the hatchery. These impacts will cease with the close of the sale activities. Alternatives D and F would have the least effect, as logging activities associated with these alternatives are not likely to be noticed from the hatchery.

Cumulative Effects

The cumulative affects analysis area is Etolin Island. Past timber sales have altered the recreation character of the island with the introduction of roads associated with the LTF at Starfish Cove in Anita Bay (central), and at Honeymoon Creek (north). The south end of the island is designated as the South Etolin Wilderness, with no past, present, or future activities proposed that would alter the character of the southern portion of Etolin Island.

Any activities proposing new road building would change the type of recreation use available in an area, regardless of whether or not the road is open to the public for motorized vehicle use after the timber sale is complete. Open roads provide motorized vehicle access, while closed roads provide hiking access. Both lessen the degree of effort needed to reach previously isolated areas and change the character of an area from undeveloped to developed.

The reasonably foreseeable activities expected to occur on Etolin include three salvage sales with no new road construction proposed. The Porcupine Salvage Timber Sale authorized the salvage harvest of approximately 766 MBF of blown down sawtimber and utility volume from 26 acres. This sale was sold in January 2009.

Fishtrap Salvage Timber Sale authorized the harvest of approximately 208 MBF of cedar decline and blown down sawtimber and utility volume from 240 acres adjacent to existing roads. This sale was sold in 2007.

North Etolin Salvage Timber Sale authorizes the harvest of approximately 200 MBF of cedar decline and blown down sawtimber and utility volume along the existing Honeymoon road system (road 6549). This sale had a decision in August 2008.

The Wrangell District Roadside Timber Sales, which would also include salvage harvest along existing roads, was added to the Schedule of Proposed Actions (SOPA) in January 2009. No cumulative effects to recreation use are anticipated, because the proposed sales will occur in areas already used for roaded recreation and no additional road construction will occur.

The Navy project proposes alternatives for harvesting timber that involve different road construction strategies that will add to the developed nature of the north end of Etolin Island. The alternatives that propose road building off the existing road system at Starfish Cove would have less of a cumulative effect to the recreation use of the island than Alternative C, which proposes a new road system with LTF at Cooney Cove. Building roads at Cooney Cove would result in a more-developed character for Etolin Island with the increase of one portal for road-based recreation.

The action alternatives would result in small changes (up to 8 percent of the total acres in the Navy project area) in the Recreation Opportunity Spectrum Inventory, and would result in a temporary increase in noise and traffic for recreation users to encounter while timber harvest activities are taking place. However, the effects proposed by the alternatives would not significantly decrease or change the opportunity for people to use the area for established recreation activities, nor restrict their ability to pursue new recreation opportunities.

Scenery

Introduction

This section describes the viewsheds and effects to these viewsheds due to all potential management activities. This section defines and discusses the existing and future visual condition, visual absorption capacity, and scenic integrity objectives.

Among the list of requirements outlined in section 6 (g)3 of the National Forest Management Act (NFMA) of 1976, is that which requires interdisciplinary review for impacts to aesthetics, along with engineering, environmental, biological, and economic effects.

The Tongass National Forest Land and Resource Management Plan (Forest Plan) implements this requirement by making scenery its own unique resource category in both its management prescriptions (pages 3-101 to 3-108) and Forest-wide Standards and Guidelines (pages 4-56 to 4-63).

To help resource specialists better meet stated goals and objectives for the scenery of a particular forest plan, the Forest Service developed and implemented the Visual Management System in 1974. This long-serving system was replaced by the newer (but similar) Scenery Management System and implemented in the 2008 Forest Plan.

The statements made and/or conclusions drawn in this report result from applying the Scenery Management System.

The project area was field verified and recorded by the resource specialist during the summer of 2006. Spatial information used for study is based on the most current and accurate geographic information system (GIS) information available.

Analysis Area

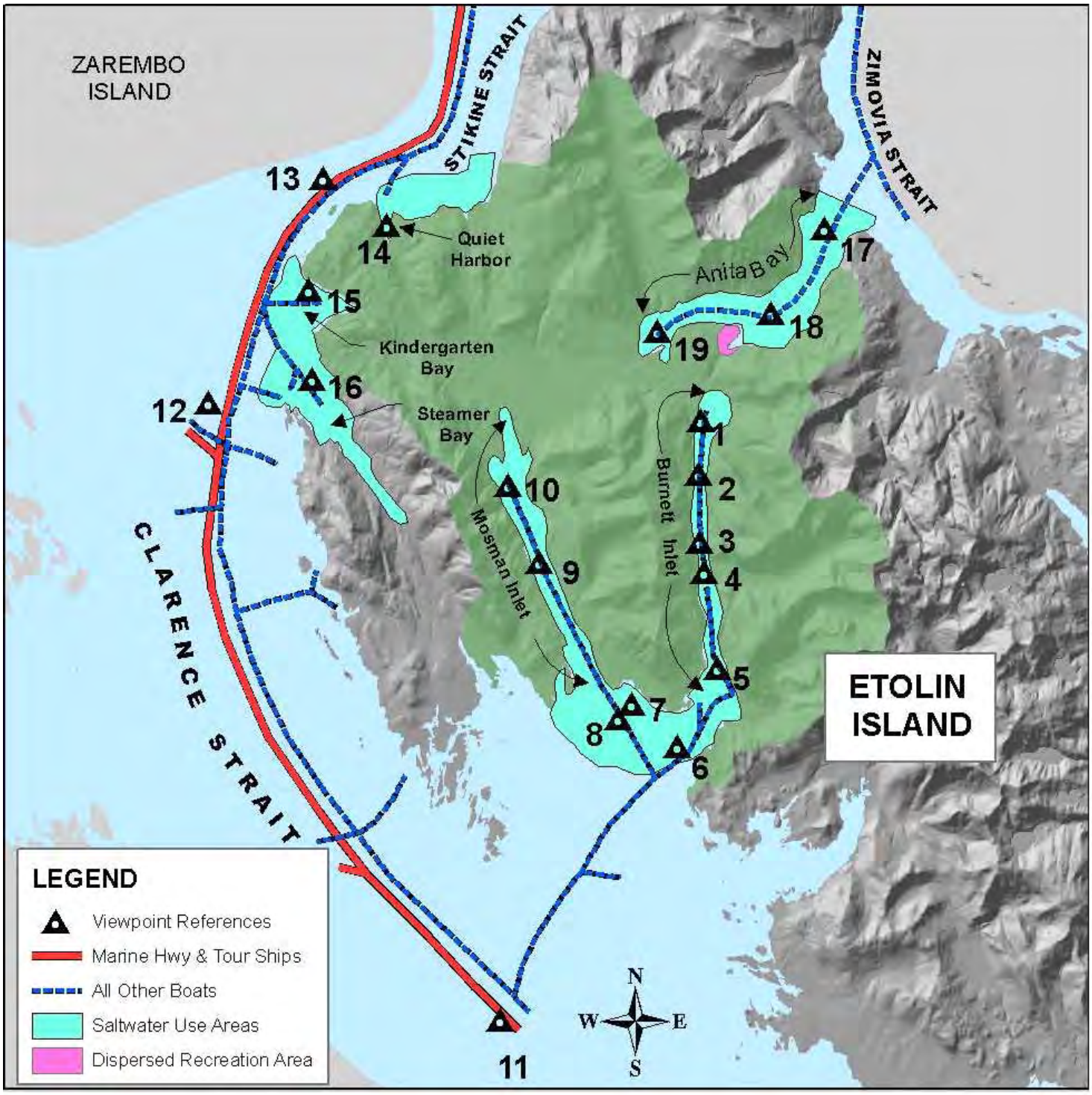
The analysis area used for direct, indirect, and cumulative effects is the project area expanded out to chosen viewpoints (see Figure 3-12). The analysis used the project area because it covers the viewshed that included all past and planned future harvest and road-building activities as seen from the chosen viewpoints. The viewpoints were limited to a reasonable number of suitable viewpoints for comparison study. For this analysis, professional judgment was used to determine the aspects of a viewshed a casual observer is most likely to focus on, and from where.

Priority Travel Routes, Use Areas, and Viewpoints

The Forest Plan (2008 Forest Plan, Appendix F) identifies places from which scenery is to be emphasized on the Forest for each Ranger District. These can be routes, which ferries, personal watercraft, and cruise ships frequently travel or destinations used for anchorage. They can also be drivable roads, cabins, recreation areas, and/or hiking trails.

For the Navy project, 19 viewpoints were established in areas most likely viewed by casual observers (Figure 3-12).

Figure 3-12
Viewpoint Locations Related to Priority Travel Routes and Use Areas



Source: Matthew Boisseau, District Landscape Architect, Forest Plan and GIS information

Summary of Effects

Scenic direct and indirect effects can result from timber harvest, road and landing construction, and visual contrasts created by slash and second growth. All alternatives' proposed activities would meet the Forest Plan scenic integrity objectives (SIOs), with the exception of the clearcut with 15% retention prescription in some settings in Units 112 and 113 in Alternative C. These effects are dynamic and, in general, would diminish over time.

Few impacts due to past harvests are noticeable in the Navy project area. The cumulative effects of past, proposed, and planned activities may change the existing scenic integrity (ESI) ratings, but all areas (except Units 112 and 113 in Alternative C) would still meet the Forest Plan adopted SIO.

Affected Environment

Etolin Island, including the Navy project area, lies within the Coastal Hills visual character type (Visual Character Types, USDA Forest Service, 1979) which is typified by steep, highly dissected landforms rising sharply out of saltwater.

The little area of lowland plains that are evident occurs mainly at the heads of Anita and Mosman Bays.

Most of the alpine areas, small island complexes, and several bays were given a distinctive variety class rating. Much of the rest of the mountainous portion of the island was rated common, while the lower rolling portions rated minimal.

The existing scenery condition of the Navy project area is a result of timber sales that took place from 1916 until 2001. The earlier sales (1916 – 1954) took place in what is now designated as beach buffer at the head and mouth of Burnett Inlet, and mouth of Mosman Inlet. Visual evidence of these early harvests is virtually non-existent today.

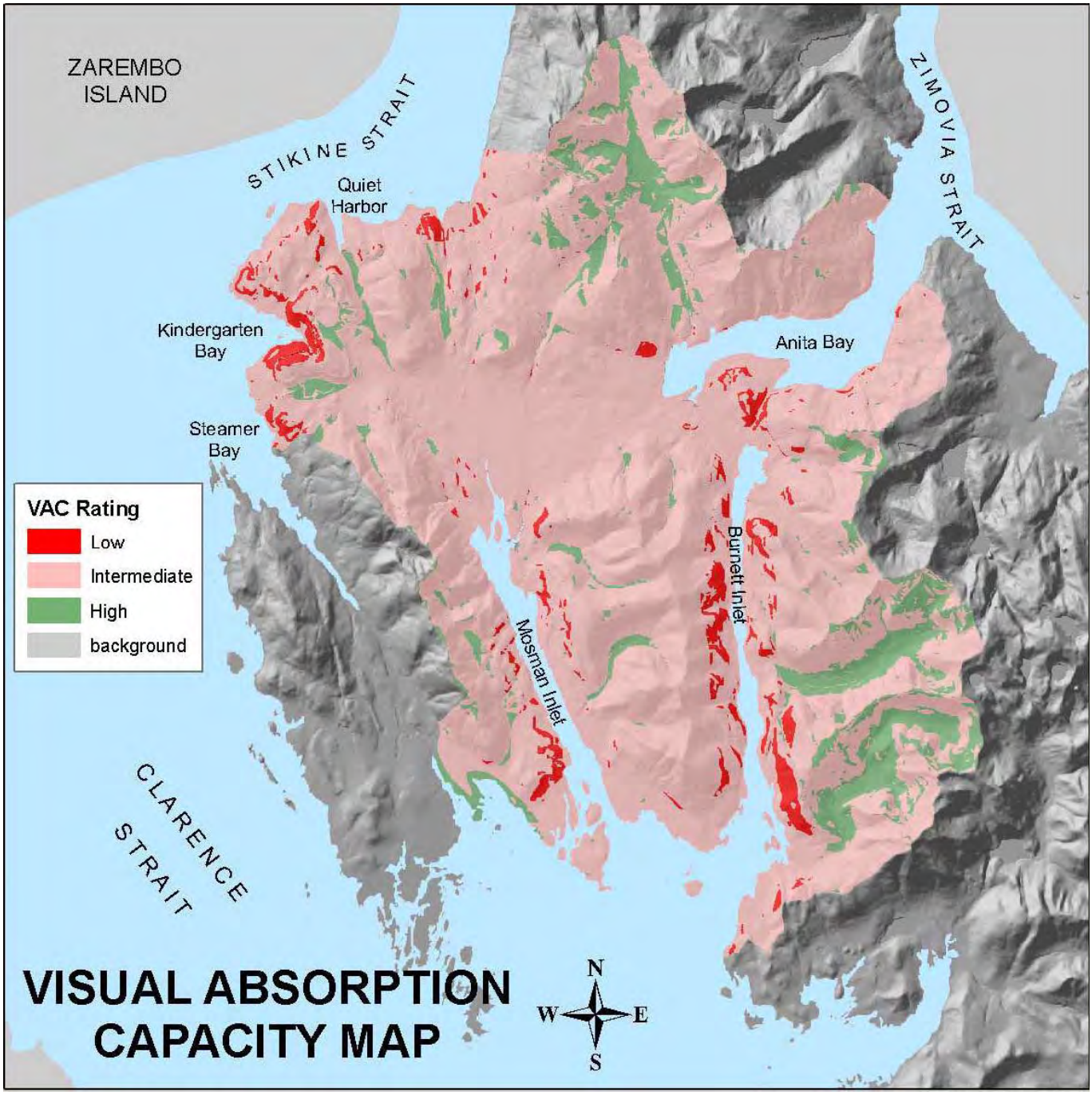
Much of the harvest activity in the Navy project area has occurred over the past 25 years, and is concentrated mostly in the north central to northwest portion of the island. Visual evidence of these sales is prominent at the head of Mosman and Burnett Inlets, and all of Anita Bay, Kindergarten Harbor, and from Clarence Strait (looking towards Kindergarten Harbor).

Visual Absorption Capability

Visual absorption capability (VAC) is defined as an estimate of the relative ability of a landscape to accept management manipulations (e.g. timber harvesting) without significantly affecting its visual character, a measure of the relative capacity of the land to absorb visual change.

The criterion found in Chapter 500 of the Landscape Management Handbook (FS 2309. 22) was used to determine VAC. VAC is rated as High, Intermediate, or Low. High VAC means the landscape has a higher estimated tolerance for activity; Low VAC means a lower tolerance for activity, and Intermediate is in-between.

Figure 3-13
Visual Absorption Capacity (VAC) Map



Source: Matthew Boisseau, District Landscape Architect, Forest Plan, Landscape Management Handbook, and corporate GIS information

Existing and Future Scenic Integrity

Existing scenic integrity (ESI) is a measurement that rates the degree of change that has already occurred on the ground. ESI is based on actual observation and is rated on a scale of I – VI. Existing visual condition (EVC) or ESI terms can be used interchangeably.

ESI describes the existing scenic integrity at the landscape level, while SIO, discussed previously, describes the future visual condition.

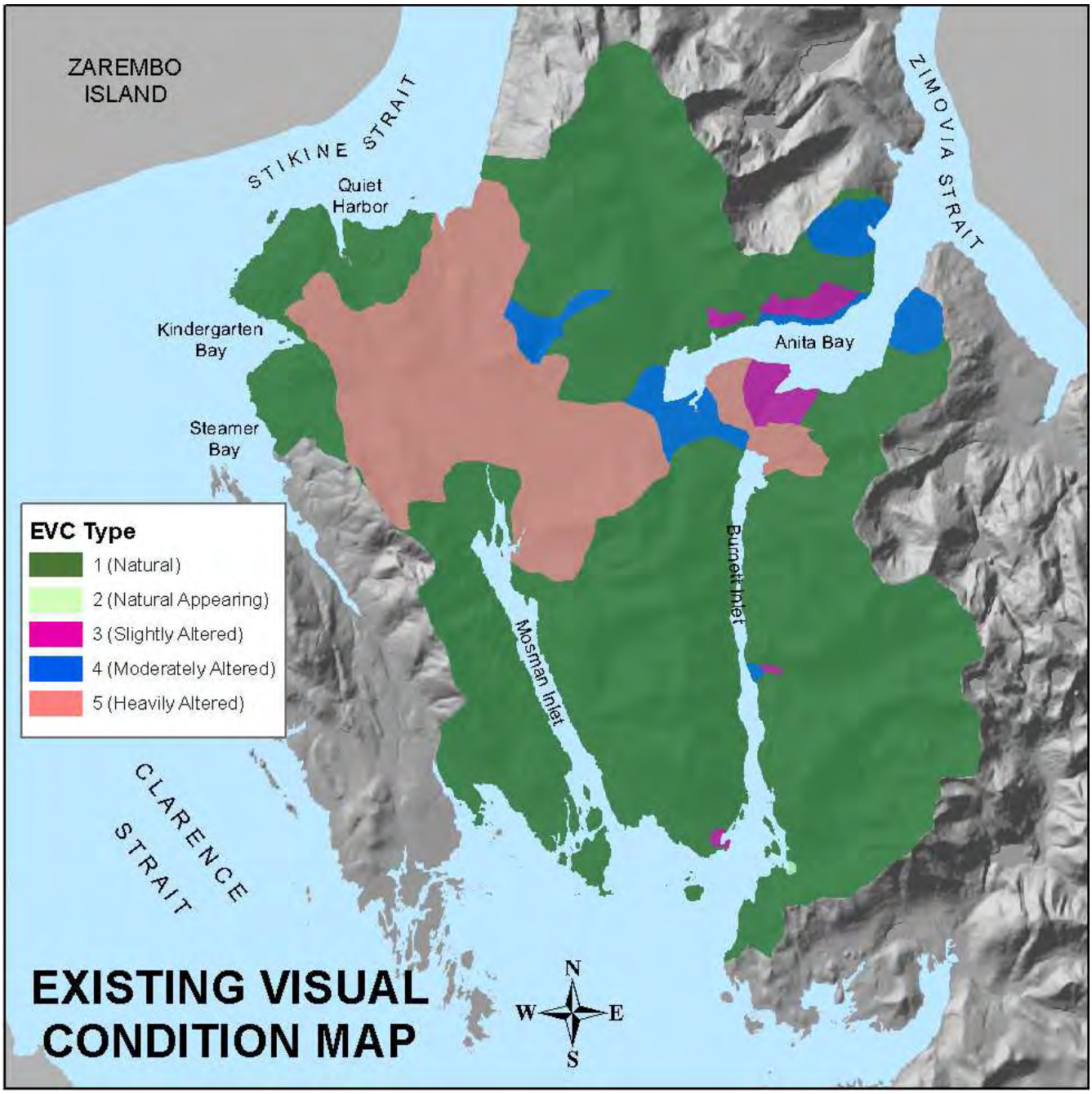
Table 3-21 describes the ESI rating and compares it to its corresponding SIO.

Table 3-21
Existing Scenic Integrity and Corresponding SIO

ESI Type	Existing Visual Condition	Corresponding SIO
I	Appears to be untouched by human activities, except for trails needed for access; only ecological changes have occurred (natural)	Preservation
II	Changes in the landscape are not noticed unless pointed out (natural appearing)	High
III	Changes in the landscape are noticed as minor disturbances, but the natural appearance of the landscape remains dominant (slightly altered)	Moderate
IV	Changes in the landscape are easily noticed and perceived as disturbances, but resemble natural patterns (moderately altered)	Low
V	Changes stand out as a dominant impression on the landscape, yet are shaped to resemble natural patterns from 3-5 miles or more distant (heavily altered)	Very low
VI	Changes are in glaring contrast to the landscape's natural appearance; excessive visual alteration has occurred.	N/A

Source: Matthew Boisseau, District Landscape Architect, corporate GIS information

Figure 3-14
Existing Visual Conditions (ESI/EVC) Map



Source: Matthew Boisseau, District Landscape Architect, corporate GIS information

Environmental Effects

Scenic Integrity Objectives

Scenic integrity objectives (SIOs) refer to the degree of acceptable alteration to the characteristic landscape. SIOs vary by LUD and visibility from visual priority travel routes and use areas.

The Forest Service uses SIOs to describe the desired future visual condition of the landscape as seen by the casual observer. The following SIOs apply to the Navy project area:

High: Activity on the landscape is not readily evident.

Moderate: Activity is visible, but does not dominate landscape. This objective is to be accomplished within 6 months following project completion.

Low: Activity can dominate, but must blend with surrounding landscape. This SIO should be met within 1 year in the foreground distance zone and within 5 years in the middleground distance zones.

Very Low: Activity clearly dominates, but must blend to some degree when viewed as background.

Table 3-22
Required SIO Based on LUD and Distance Zone

Land use designation (LUD)	Foreground distance zone (0- 1/4 mile)	Middleground distance zone (1/4 – 3 miles)	Background distance zone (3 miles +)	Not seen
Timber production	low	very low	very low	very low
Modified landscape	moderate	low	low	very low
Scenic viewshed	high	moderate	moderate	very low
Old-growth habitat	high	high	high	high
Semi-remote recreation	high	high	high	high

Source: Matthew Boisseau, District Landscape Architect, corporate GIS information

All seen proposed units (except those viewed from Clarence Strait) are in the middleground distance zone. Most units seen from Clarence Strait are in the background distance zone.

Timber Harvest Guidelines for Meeting SIO

The Forest Plan Standards and Guidelines recommend approximate unit size and harvest prescription for managing scenery based on the combination of SIO, VAC, and LUD. All proposed units for all action alternatives followed these standards and guidelines.

As stated in the Forest Plan (p. 4-56), size, shape, orientation to viewer, color, and texture are critical elements in determining whether assigned SIOs are being met. Landscape settings are different and should be evaluated on a case-by-case basis. There may be instances where the SIOs can be met while the proposed activity (e.g., unit size) is greater than the guideline, or where the activity must be smaller to meet the intent of the SIO.

Direct and Indirect Effects

Each action alternative has the potential to change the form, line, color, and texture of the natural landscape of the Navy project area. Representative three-dimensional views were created in GIS (ArcScene) for this analysis.

Table 3-23 displays the analysis process and results. Although Old-growth and Semi-remote Recreation LUDs are found in the project area, harvest is not permitted in them so they are not presented in the table.

Table 3-23
Analysis Process and Summary of Direct and Indirect Effects

IF area where unit is proposed is in a:	**THEN the prescribed scenic integrity objective is:**	**AND when combined with a VAC rating of:**	**ACCEPTABLE RX[1]:**	**RESULT 1: The following units meet SIOs based upon this method.[2]**	**RESULT 2: Not all units met SIO based on the previous steps. Some required additional design to ensure that SIO was met.[3]**
Unseen Area	Very Low	Any	80 - 150	(101 total) 1, 2, 3, 4, 5, 35, 36, 37, 40, 43, 44, 45, 47, 48, 49, 51, 52, 53, 55, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 73, 74, 75, 76, 77, 78, 79, 80, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 94, 95, 96, 97, 99, 100, 101, 103, 104, 105, 106, 108, 109, 111, 112, 113, 114, 115, 116, 117, 124, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 137, 138, 139, 141, 123, 125	
Timber Production LUD (middle and background)	Very Low	Low	50 - 70	(25 total) 35, 36, 37, 41, 43, 44, 46, 50, 64, 65, 67, 68, 72, 74, 78, 93, 95, 118, 119, 120, 121, 122, 123, 125, 135	
	"	Intermediate	80 - 100		
	"	High	80 - 150		
Modified Landscape LUD (middle and background)	Low	Low	15 - 40	(28 total) 8, 35, 36, 37, 38, 39, 40, 41, 52, 53, 54, 55, 56, 69, 79, 136, 137, 138, 139, 140	34, 70
	"	Intermediate	40 - 60		
	"	High	60 - 100		
Scenic Viewshed LUD (middle and background)	Moderate	Low	5 - 10 acres, or group selection (< 2 acres)	(31 total) 6, 36, 37, 40, 41, 42, 50, 51, 56, 57 67, 81, 82, 83, 84, 85, 97, 98, 102, 107, 110, 137, 138, 139	7, 8, 112, 113
	Moderate	Intermediate	15-40		
	Moderate	High	15-30		

[1] Clearcut sizes (without reserves) in this size range are acceptable according to Forest Plan Standards and Guidelines

[2] The previous steps are not the only determinant for meeting SIOs (unless unseen). Factors like prescription, reserves, size, shape, texture, integrity, distance, orientation to viewer, etc., needed consideration.

[3] Direction for achieving SIO is written in the scenery section of the unit card.

Source: Matthew Boisseau, Landscape Architect, Forest Plan and harvest unit GIS information

Effects were analyzed for each priority travel route and use area from various viewpoints by alternative where scenic quality is a concern. Harvest units were subdivided into settings for a more-detailed scenery analysis. Those settings are displayed on the unit cards (Appendix B of the Draft EIS). A lengthy table, containing all of the unit settings and whether they are seen or unseen, is located in the Scenery Resource Report (Details of Effects by Units and Settings). The effects analysis below provides a summary of the units and units settings that are seen or unseen.

Alternative A

The No-action Alternative proposes no new timber harvest, road construction, or other enhancement projects within the project area. 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.

No existing roads were seen from travel routes during the existing conditions analysis.

Alternative B

In Alternative B, 72 unit settings are seen, and 51 unit settings are unseen. The visual effects of timber harvest would be most apparent to people in boats at the head and mouth of Burnett Inlet, the central portion of Mosman Inlet, and from the center of Anita Bay. The viewsheds seen from Stikine Strait, Quiet Harbor, Kindergarten and Steamer Bays would benefit under this because of the lack of activity proposed there.

The LTFs at Anita Bay would be visible from very specific points along the travel routes, not from a majority.

The new roads that serve the head of Mosman Inlet and Burnett Inlet units would be mostly unseen. Their placement is at the toes of the slopes, or bottom portions of the units they serve, and are situated behind the shoreline vegetation in the vast majority of cases, effectively obscured from sight to the casual observer. A level of scenic quality that meets the Forest Plan adopted scenic integrity objectives will be met, regardless.

Alternative C

Alternative C would have the greatest impact to scenery of all the alternatives, simply because more units are seen than in any of the others, and therefore, the chance to see disturbance is inherently greater. This alternative has 124 unit settings that are seen, and 132 that are unseen.

Most of the roads proposed will be unseen for the reasons given under Alternative B. If seen, only aspects will be visible and appear where they traverse through the upper-sloped portions of seen units like Units 57 (vicinity of Burnett Inlet) and the cluster of Units 6, 7, and 8 (southwest portion of Mosman Inlet) where a road is proposed for the LTF at Cooney Cove.

The cluster of visible settings for Units 112 and 113, as seen from Stikine Strait (the northwest corner of the project area), are serviced by roads. Units 113 and 112 have unit settings in the middleground of the Scenic Viewshed LUD, and must meet a moderate scenic integrity objective. Some settings call for single-tree selection harvest, not clearcut, which is typical for road-connected units. Under Alternative C, the clearcut with 15 percent reserves (CCR15) prescription assigned for settings T275, T277, and T280 in Unit 113 and settings 282 and 287 in Unit 112 will create too large an opening(s), when viewed independently and cumulatively from visual priority

routes, and fail to meet the moderate scenic integrity objective. The unit settings under that current prescription would result in a low SIO. A clearcut prescription with 50 percent reserves minimum (leaving strategically placed islands of trees or clumps), or single-tree selection (STS) like the other unit settings in Alternative C, would allow the landscape to meet its scenic integrity objectives.

The only priority travel route within the line of sight of the LTF at Cooney Cove is Clarence Strait. However, the distance from the ferry route there to the LTF is 6 to 8 nautical miles, and will likely be unseen to the casual observer. With the exception of the clearcut with 15 percent reserve trees settings in Units 112 and 113, a level of scenic quality that meets the Forest Plan adopted scenic integrity objectives will be met, regardless.

Alternative D

Alternative D is similar to Alternative B, but offers 36 unit settings that are seen, and 65 that are unseen. No harvest, LTF, or roads at the east end, mouth of the Burnett Inlet viewshed, are proposed. Unlike Alternative C, no harvests, LTF, or roads are proposed in the southwest, mouth of Mosman Inlet location. Due to minimal activity, Quiet Harbor, Kindergarten Bay, Steamer Bay, and the mouths of Burnett and Mosman Inlets will benefit most. Although most activity occurs in areas of the other viewsheds, a level of scenic quality that meets the Forest Plan adopted scenic integrity objectives will be met, regardless.

Alternative E

Alternative E proposes 71 unit settings that are seen, and 85 that are unseen. The effects to the viewshed of Burnett Inlet are the same as Alternative D. The viewsheds of Quiet Harbor, Kindergarten Bay, Steamer Bay, and Stikine Strait are affected in the same manner as Alternative C, but the setting cluster of Unit 13 as seen from Stikine Strait is helicopter logged instead of shovel logged. The Mosman Inlet and Anita Bay viewsheds benefit more under Alternative E then they do under B, C, and D, because less activity is planned there. The road and LTF plans are the same as under Alternative D (minus the central Mosman Inlet units), so effects are the same as well. A level of scenic quality that meets the Forest Plan adopted scenic integrity objectives will result.

Alternative F

Alternative F proposes 27 unit settings that are seen, and 34 that are unseen. Consequently, this alternative is the most beneficial to the scenic resources. The only viewsheds where effects would be noticed are the very head of Mosman Inlet, and along Anita Bay. No new roads are proposed, and all new units are near previously harvested units. Activity takes place in Timber Production (TM) or Modified Landscape (ML) LUDs almost exclusively. Only Unit 37, setting M149, occurs in a section of Scenic Viewshed. A level of scenic quality that meets the Forest Plan adopted scenic integrity objectives will result.

Cumulative Effects by Viewshed

Cumulative effects are the result of collective past, present, and reasonably foreseeable future actions. These effects include timber harvest, roads, landings, and contrasts created by slash and second growth. Cumulative effects also include harvest activities on adjacent non-National Forest System lands. These effects are dynamic and, in general, would diminish over time.

Visual Recovery Rates

The potential for timber harvest to dominate visually is greatest immediately following the activity.

Activities such as cut and fill slopes, rock pits, stumps, debris, and turnouts are typically seen when viewed up close. As viewed in the middleground, vivid distinction in texture, line, and color between the mature forest and the harvest unit would be apparent. Newly exposed trunks and limbs would dominate the visual setting when openings are present.

The following recovery rate guidelines are used to predict when past harvest activity will resort to a natural state, or to a condition that meets scenic integrity objectives, if not currently met.

Years 1 – 5: By the fifth year of regeneration, the new forest would be filling out with low-lying vegetation. On poor and disturbed mineral soils, alder would be present. In the foreground, the visual effects of the clearcut would be evident, but shrubby vegetation and young trees would begin to cover the stumps and exposed ground. In the middleground, the harvest unit would contrast with the natural landscape to varying degrees, depending on the level of retention.

Years 5 – 25: Young trees would become established and reach a height of approximately 20 feet. Foreground views created within the original harvest unit would become limited. In the middleground, the contrast between the new forest and mature forest would still be obvious but not appear dominant to the casual observer.

Years 25 – 50: At the end of 50 years, trees would reach heights of 50 to 60 feet. As seen in the middleground, the stand would be approximately half the height of adjacent mature stands. Boundaries between the harvested stand and mature stands would begin to blur. At this time, the canopy would be fairly closed and the new forest very dense. Generally, large harvested areas on steep slopes would appear near natural to casual forest visitors. Smaller units on gentler slopes would appear near natural somewhat sooner.

Years 50 – 80: At 80 years, the stand would reach about 75 percent of its mature height. From the middleground, there would still be some distinction between this stand and adjacent mature forest.

Years 80 – 100: At 100 years, trees would be about 100 feet tall. The canopy would appear healthy, lush, and full. In the middleground, color and texture would be similar to adjacent over- mature stands. These previous harvests may still be discernible from over-mature stands, due to their lack of scattered dead tops and a generally more regular growth pattern.

Few impacts due to past harvests and proposed salvaged sales are noticeable in the Navy project area. Most of these harvests are located the north-central portion of the island, in Timber Production settings away from the shorelines, and are mostly unseen.

The cumulative effects of past and proposed activity may change existing visual condition ratings, but not in a manner to exceed SIO. The following are descriptions of the anticipated visual conditions within each viewshed of the priority travel route/use areas analyzed.

Stikine Strait

The entire shoreline along the northwest corner of the Navy project area is seen from Stikine Strait, where approximately 2/3 of the viewshed is in the SV LUD, and 1/3 is in the Old-growth LUD.

For the Old-growth LUD, the ESI is rated as I (natural) and would remain unchanged.

The ESI for the SV LUD would change from I (natural) to III (slightly altered).

The cumulative effects would result in a future visual condition that corresponds with a moderate SIO, and would meet the Forest Plan Scenery Standards and Guidelines. The only exception is Units 112 and 113 in Alternative C, in which the settings with a prescription of CCR15 would result in a low SIO. This condition could persist for 50 years, until the boundaries between the harvested stand and mature stands begin to blur, and the visible activity no longer dominates the landscape.

Clarence Strait

Only a small portion of previous harvest can be seen from Clarence Strait - a unit from a 1988 sale, at the head of Kindergarten Bay, which is in a TM LUD. The ESI for that unit is rated as IV (heavily altered), and corresponds with a very low SIO.

The distance from Clarence Strait travel route (mostly by ferry and cruise ship) to the shoreline of the project area is 5–8 miles. Therefore, effects of the moderate and STS prescriptions are likely to be unseen or unnoticed by the casual observer.

The cumulative effects would result in a future visual condition that corresponds with high/moderate SIO, and would meet the Forest Plan Scenery Standards and Guidelines.

Anita Bay

Anita Bay is the most heavily altered viewshed in the Navy project area, with evidence of harvest activity from 1926 to 1999. As a result, the viewshed's ESI is diverse, with areas rated as I, II (natural appearing), IV (moderately altered), and V (heavily altered).

The areas of past harvests that are seen (and where new units are proposed) exist in TM and ML LUDs, where scenic integrity objectives are very low and low.

The cumulative effects would change the ESI rating in the following two areas, but would meet the overall SIO for the viewshed.

The current ESI I area near the proposed Anita Bay LTF would change to a future scenic integrity rating of IV (or corresponding SIO of low).

The current ESI I area, north to northwest of the head of Anita Bay, would change to a future scenic integrity rating of III (or corresponding SIO of moderate).

Quiet Harbor

The viewshed of Quiet Harbor is small; only a hilltop looking west is noticeable beyond the height of the shoreline trees. The current ESI rating for this area is I, with no past harvest evident.

The future visual condition would change the area's current rating from I to III.

The cumulative effects would result in a future visual condition that corresponds to the moderate SIO, and would meet the Forest Plan Scenery Standards and Guidelines.

Kindergarten Bay

The edge of a unit from a 1988 harvest is visible from the middle of Kindergarten Bay, resulting in an ESI rating of V. However, that unit is in a TM LUD, and the visual condition corresponds to the very low SIO.

The proposed units to the north and south of Kindergarten Bay are in a moderate SIO with a helicopter-harvested STS prescription. The ESI for these areas are I, but would change to either II or III. The corresponding SIO for the future condition would be moderate at most.

The cumulative effects would result in a future visual condition that meets the Forest Plan Scenery Standards and Guidelines.

Steamer Bay

No past harvest is visible from the Steamer Bay viewshed, which has areas with ESI ratings of I and V. Of the two new seen units, one is in the TM LUD and the other in the SV LUD.

The ESI for the area that is in the TM LUD is currently rated as a V; it would not change. The area currently rated as I would likely change to II in the future. Both would still meet the SIO of very low and moderate for their respective LUDs.

The cumulative effects would result in a future visual condition that meets the Forest Plan Scenery Standards and Guidelines.

Mosman Inlet

The areas located at the mouth and all along the channel to the head of the inlet are in the SV and ML LUDs and are currently rated as an I. In this area, past harvests occurred between 1917 and 1945; these harvests were not noticed during analysis. The corresponding SIO of moderate and low would be met.

The area at the head of the inlet, to the east and north is in a TM LUD and is currently rated as a V. Past harvest in this area is clearly noticeable, since it took place in the late 1980s to mid 1990s. The corresponding SIO of very low would be met.

The cumulative effects would result in a future visual condition that meets the Forest Plan Scenery Standards and Guidelines.

Burnett Inlet

As with Mosman, the ESI rating of the Burnett Inlet viewshed is either I or V, though a small section of ESI IV exists to the west of the inlet's head.

Most of Burnett Inlet is rated ESI I, even though a large portion of it is in the TM LUD at the northeast side of the channel. Past harvest in the ESI I area at the mouth of the inlet occurred from 1917 to 1953, but was not noticed during analysis. The corresponding SIO of moderate and low would be met.

The past harvests in the ESI V rated area are clearly noticeable, since they took place in the 1980s and 1990s. The corresponding SIO of very low would be met.

The cumulative effects would result in a future visual condition that meets the Forest Plan Scenery Standards and Guidelines.

Roads and Log Transfer Facilities (LTFs) Mitigations

In most cases, where new roads are proposed, they are obscured by the shoreline trees and located at the toe of slopes and unseen portions of the unit. Retaining shoreline trees adjacent to LTFs would increase scenic integrity for boaters looking upon the landscape, within the vicinity of these sites.

Silviculture

Introduction

This section of Chapter 3 discusses how each alternative would change the forest structure, species composition, and future forest health by implementing varying levels and/or combinations of three different silvicultural systems. The three systems include even-aged, two-aged, and uneven-aged management.

Analysis Area

The analysis area for direct and indirect effects is limited to harvest units, because the harvest activities generally do not influence the forest structure, species composition or forest health beyond these boundaries. The cumulative effects analysis area of this project considers all Etolin Island, except for the South Etolin Wilderness area, to ensure that all harvest and/or silvicultural activities, which alter forest structure, composition or forest health, are included. A comprehensive description of the analysis area and inventory methods is found in the Silviculture Resource Report.

Summary of Effects

All treated stands will be reforested within 5 years with suitable species composition. Harvested stands are considered mature and have reached or surpass their culmination of mean annual increment. This is the age in the growth cycle of a stand in which the stand is growing less than its average annual growth.

The alternatives that treat more acres with even-aged silvicultural systems are generally more favorable for meeting the forest health, improved timber growth, and productivity objectives of Timber Production LUDs.

Affected Environment

Forest Stand Structure

Stand structures for the old-growth forest in the Navy project area include uneven-aged (multi-storied), two-aged (two-storied), and even-aged (single-storied). Uneven-aged structure accounts for approximately 94 percent of the suitable timberlands and is typically greater than 300 years old. Western hemlock is typically the dominant upper-canopy tree species, with cedars and spruce present in varying amounts. Lower-canopy layers are also typically dominated by hemlock.

Most of these stands are of wind disturbance origin. Single large wind events and several smaller wind events have resulted in the variety of stand age and structural characteristics found across the landscape.

Species Composition

The project area tree species composition by basal area includes: western hemlock (53 percent), mountain hemlock (4 percent), Sitka spruce (7 percent), yellow-cedar (17 percent) and western redcedar (19 percent), based on stand examination data.

Forest Health/Natural Disturbances

The following disturbance factors affect forest health within the analysis area. Unit-specific information regarding these factors is in Appendix A of the Silviculture Resource Report.

Wind Disturbance

Wind is the major natural disturbance agent in the Navy project area. It occurs in two forms: small-scale gap-phase disturbance and large-scale stand-replacing disturbance.

Most of the island is subject to gap-phase windthrow events. Individual trees, or small groups of trees, blow over during windstorms, opening the canopy and allowing young trees to grow to fill the openings. Stands in high-risk wind-hazard areas rarely attain ages greater than 250 years old, and are more often replaced before reaching 150 years old. In such areas, even-aged management is the preferred regeneration method. Two-aged and uneven-aged systems should be used only after evaluating potential effects of wind.

Stands were analyzed for risk of stand-replacing windthrow using Kramer's model (Nowacki and Kramer 1998, Kramer et al. 2001) in conjunction with ground observations and aerial photo interpretation of stands generated by past windthrow. Kramer's wind model rates the level of windthrow risk based on four abiotic factors (slope, elevation, soil stability, and exposure to prevailing storm winds (aspect)). Ground observations and aerial photo interpretation of past windthrow in adjacent past harvested units, appearance of wind-damaged crowns, mound-and-pit topography (Harris 1999), and appearance of even-aged structure without indications of other disturbance processes were also used indicate substantial windthrow risk. Wind influences are of particular concern in these areas when determining appropriate silvicultural systems, leave area windfirmness, and in unit layout.

Hemlock Dwarf-mistletoe

Dwarf mistletoe (*Arceuthobium tsugense*), a parasitic plant, reduces the vigor and growth rate of western and mountain hemlock and often produces low-quality timber. Dwarf mistletoe is best managed with even-aged silvicultural systems. Removing the overstory removes the source of infection. Partial removals do not completely remove the source of infection to the new developing stand. The occurrence of dwarf mistletoe varies throughout the project area.

Alaska Yellow-cedar Decline

Yellow-cedar mortality became abnormal around 1900 and has accelerated (Forest Health Conditions in Alaska-2006, R10-PR11, April 2007). Mortality occurs in open canopy stands occupying wet, poorly drained soils (Hennon et al., 1997). Research suggests that the primary cause of the approximate 500,000 acres of yellow-cedar mortality in Southeast Alaska is not associated to organisms such as fungi, insects, nematodes viruses, and phytoplasmas. Current thought has focused on the possibility that one or more abiotic factors have instigated the decline. In particular, freezing and soil toxicity have been proposed as the causal factors (Schaberg et al., 2005).

Decay Fungi

Decay fungi are present in the project area at various levels and types throughout the study area. Approximately one-third of the volume of old growth in Southeast Alaska is defective due to heart rot (Forest Health Conditions in Alaska-2006, R10-PR11, April 2007). Root diseases are also considered significant. The silvicultural systems chosen are designed to remove infected trees with harvest treatments. Even-aged systems are an effective treatment for removing infected timber. Decay fungi are not expected to impact regeneration.

Porcupine Damage

Porcupine (*Erethizon dorsatum*) occur only on the mainland, and some islands in Southeast Alaska; Etolin Island has a well-established resident porcupine population. Porcupine can negatively affect tree regeneration and growth in young stands, particularly stands 15 to 35 years of age (Sullivan and Cheng 1989) and cause greater levels of defect. Cumulative porcupine damage to regenerating stands can result in

slower tree growth, creation of entry points for stem decay due to scarring, and eventually girdling of the tree causing dead tops or tree mortality. Based on field examination of existing damage on Etolin Island, the porcupine do not prefer western red or yellow-cedar, thus leaving cedar seed trees or planting is a possible method of reducing porcupine damage to future crop trees.

The population size of porcupine and the potential for future damage is considered high for the analysis areas.

Past Management

To date, 4,147 acres (GIS) have been harvested within the Navy project area using an even-aged silvicultural system. Harvest along the beach fringe first occurred in 1917 and continued through the 1970s. Large-scale clearcut harvest began in the project area in the 1980s.

All stands within the project area have been successfully regenerated. There were 3,007 acres that were naturally regenerated and 1,140 acres were regenerated using supplemental tree planting. Site preparation, composed of 155 acres of broadcast burning, was performed in some harvest units prior to planting.

Precommercial thinning tends to open up stands with closed canopies to additional sunlight, allowing understory vegetation to persist longer. It can speed up stand development to obtain later seral stages sooner, diversify the stand structure, and encourage a desired species mix in the regenerated stand. Tree diameter growth is increased, yielding stands with merchantable timber in less time than if left alone.

Some precommercial thinning has occurred within the project area. To date, 111 project area acres have been thinned for timber production and 15 acres have been thinned for wildlife habitat enhancement. In addition to thinning, 58 acres have also been pruned to improve wood quality.

Silvicultural Systems

The term “silvicultural system” refers to a planned process whereby a stand is harvested, reestablished and tended to achieve a desired condition. The system name is based on the number of age classes present after the initial harvest, such as even-aged, two-aged, and uneven-aged systems.

Even-aged Systems

Clearcut: Essentially all trees in a harvest unit are removed in a single operation, regenerating the unit into a single-aged stand. In the Navy project area, clearcutting is prescribed to reduce levels of mistletoe infections, decay fungi, ensure regeneration desired tree species, and/or to minimize losses to and risk of windthrow (Harris, 1999). Natural regeneration is expected to fully stock the stand with desirable trees by year 5.

In several units (Units 1, 3, 4, 5, 6, 37, 43, 44, 45, 47, 48, 51, 58, 59, 60, 91, 66, 72, 80, 106, 109, 110, 111, 130, 133), one co-dominant or dominant cedar tree will be left as a seed tree for every 5 acres harvested to provide a seed source for the future stand. Trees will be distributed throughout the unit in areas that have a cedar component in the overstory, and will be partially girdled to provide a stress crop of cones. Leaving cedar seed trees could maintain or increase the cedar component in regenerated stands, thus minimizing future porcupine damage as cedar trees are not preferred as a browse species by porcupine.

Clearcut with reserve trees present: Even-aged management clearcut with reserve trees present results in most of the trees removed in a single operation, with some trees retained for purposes other than regeneration. Reserve trees are scattered or clumped, but are normally clumped together to meet a resource need. Depending on the

individual unit prescription, 15 percent to 50 percent of the original stand's basal area will be retained. In the Navy project area, reserve trees would be retained for wildlife habitat, to reduce visual impact of timber harvest and/or to enhance windfirmness of leave areas (i.e. RMAs, high hazard soils, visual retention patches, etc.). Natural regeneration is expected to stock fully the stand with desirable trees by year 5.

Two-aged Systems

Two-aged management clearcut with reserve trees present results in stands that have two distinct cohorts. The retention of reserve trees comprises at least 15 percent of the stand's original basal area, with standing green trees constituting a distinct age class separated in age by more than 20 percent of the rotation. Aggregations and individual reserve trees must be well distributed. Stands in this project are prescribed with 15 percent reserve trees. Reserve trees are usually selected in aggregations, individually tree marked, or designated by description. Two-aged management can produce stands of greater structural diversity than even-aged management.

In the Navy project area, reserve trees would be retained for wildlife habitat, to reduce visual impact of timber harvest and/or to further enhance wind firmness of leave areas (i.e. RMAs, high-hazard soil areas, visual retention patches, etc.). Natural regeneration is expected to fully stock the stand with desirable trees by year 5.

Uneven-aged Systems

Single-tree selection: An uneven-aged stand contains trees of three or more distinct age classes, intermixed throughout the stand. Uneven-aged stands are created through silvicultural pathways that include uneven-aged systems, or by small-scale periodic disturbance (gap phased), that allows for recruitment/release of trees, resulting in a multi-storied stand structure. Harvest trees are selected either through individual tree marking or designated by description. No more than 30 percent of the total original stand basal area will be removed, and no more that 50 percent of the original stand's basal area of spruce or cedar will be removed in this entry. No unstocked openings greater than 2 acres will be created. The regeneration of a new tree layer will be monitored in the third year post harvest. These stands will continue to develop, and be available for additional future entries (recommended in 40 years). Uneven-aged systems are prescribed for those units where it is not feasible to build NFS road, or where wildlife, riparian, or scenery concerns can be better addressed by retaining leave trees.

Environmental Effects

Direct and Indirect Effects

This section presents an overview of the effects that the proposed silvicultural treatments would have on stands in the project area. It discusses the effects of each system on species composition, stand structure development, and how each treatment addresses forest health issues identified in the affected environment. The action alternatives have varying combinations of units proposed for harvest, but the silvicultural treatment for each unit has been prescribed to address the LUD objectives, issues, and on-the-ground conditions (species composition, stand structure, and forest health) for that particular unit. Table 3-25 summarizes the treatment acres by alternative.

All the proposed units were reviewed, modeled, and rated for wind hazard. While RAW buffer prescriptions and locations are designed to minimize windthrow, some

degree of windthrow in buffers and other leave areas may occur in each action alternative. Units that are expected to require RAW buffers have been identified on the unit cards in the Draft EIS. A final determination for the necessity for RAW buffers would be made during layout. Specific information by unit is contained in Appendix A of the Silviculture Resource Report in the project record, in Appendix B, Unit Cards of the Draft EIS, and in the unit prescriptions which are in the project record.

Effects of Even-aged Management

Even-aged management affects the stand structure by creating primarily second-growth stands with or without older residual trees. Even-aged management removes the existing canopy, exposing the soil to increased sunlight, which aids regeneration of desirable species such as Sitka spruce. Soil temperatures will rise with increased sunlight, which increases both the decomposition rate of organic matter and available nitrogen in the soil. A flush of herbaceous plants and conifer seedlings should result, beginning at the Stand Initiation stage. Shade-tolerant western hemlock quickly becomes established, and Sitka spruce can compete well in open conditions if a seed source is available. The increased availability of site resources will also offer western redcedar and the slower growing, shade-tolerant, Alaska yellow-cedar a chance to regenerate. Vegetative species (blueberry, huckleberry, bunchberry, five-leaf bramble and others) competing for available sunlight will eventually give way to a closed canopy of conifers (depending on site potential) in approximately 20-30 years. This is the beginning of the next stage of forest development, Stem Exclusion. In this phase, tree growth slows and tree mortality occurs due to inter-tree competition. In addition, herbaceous vegetative growth significantly reduces due to lack of sunlight reaching the forest floor. Precommercial thinning is the preferred treatment to accelerate tree diameter growth, maintain tree species diversity and preference, and reduce the overall time a stand spends in the stem exclusion stage. This somewhat open condition after precommercial thinning will last for approximately 20 years before stem exclusion resumes. At 60-90 years of age, a commercial thinning can be performed to increase crop tree growth, and encourage the development of next development stage, Understory Initiation. The next harvest rotation is planned at approximately 100-120 years of age.

Even-aged management addresses the following forest health concerns identified in the Affected Environment section:

Wind: Even-aged management is the most effective way to deal with the risk of windthrow. Some windthrow can occur on edges of units where remaining trees have become fully exposed to wind; however, layout of units can minimize this effect. Reasonable assurance of windfirmness buffers (RAW buffer) are applied to TTRA buffers as well as Class III and IV streams to mitigate the effects of wind.

Dwarf mistletoe: Even-aged systems are effective in treating mistletoe, as this disease spreads from the overstory to the understory. Removing the overstory stops the infection cycle and allows the regeneration to grow freely.

Alaska yellow-cedar decline: Even-aged systems capture the value of trees that have been affected by this disease, but it is not effective in treating the disease, as the cause appears to be climate related. The result of Alaska yellow-cedar decline can be a species mix conversion away from yellow-cedar on the affected site (Forest Health Conditions in Alaska-2004, R10-PR3, March 2004).

Stem decay: Even-aged systems are effective in treating stem decay. The removal of infected trees reduces future stand volume loss and stops the spread of root and stem decay to other trees in the stand.

Porcupine damage: Even-aged systems can create an increased risk of porcupine damage by encouraging summer forage within the units and providing winter forage with the regeneration of western hemlock and spruce trees. Units that have less than 40 percent western red and/or yellow cedar will have cedar seed trees retained to minimize the effects of porcupine.

Effects of Two-aged Management:

The two-aged silvicultural system using clearcut with reserves regeneration method will retain trees 16 inches DBH or under and harvest 85 percent or less of the original stand's basal area. The understory will naturally regenerate rapidly identical to an even-aged stand but will have a higher proportion of advanced regeneration. This regeneration should respond to the created conditions, requiring precommercial thinning in 20-30 years. The resulting stand structure would consist of primarily second-growth stands with older residual trees. The older, reserved trees should increase in growth, providing vertical crown diversity and wildlife structure, and should maintain scenic quality by meeting the scenic integrity objective (SIO) requirement of Moderate. The reserve trees are scheduled for removal, with the understory trees that are scheduled for commercial thinning, in approximately 60 to 80 years. These stands will follow the same basic stages of forest stand development described in the proceeding paragraph, Effects of Even-aged Management.

Two-aged management addresses the following forest health concerns identified in the Affected Environment section:

Wind: Two-aged management for the Navy units is limited to retaining all trees 16 inches or under, with at least 15 percent of the stand's basal area retained throughout the unit. This removes a high percentage of the larger trees, leaving the remaining trees susceptible to wind damage. However, the remaining smaller trees will have time to develop additional root systems and improve their height-to-diameter ratio, which will improve their resistance to wind.

Dwarf mistletoe: Two-aged systems are not as effective as even-aged management. Retained trees are likely to be infected to some degree, which could infect the regenerating stand.

Alaska yellow-cedar decline: As in even-aged systems, the value of affected trees can be realized by harvest, but it is not effective in treating the disease, as the cause appears to be climate related.

Stem decay: Two-aged management is effective in treating stem decay; however, it is not as effective as even-aged management. The residual trees, being 16 inches or less in DBH, are suppressed or intermediate; as such, they are prone to scarring from mechanical or natural causes, which can provide a source of infection.

Porcupine damage: Two-aged management is not effective in dealing with the effects of porcupine. The removal of most of the larger trees allows summer forage to develop, with the retained smaller-diameter trees being susceptible to winter-feeding by porcupines.

Effects of Uneven-aged Management

This treatment will retain a minimum of 70 percent of the stand's original basal area, with retention of 50 percent or more of the Sitka spruce, western redcedar, and Alaska yellow-cedar basal area. Uneven-aged harvest would create stands with a variable stand and age structure, depending on the site-specific prescriptions. It is expected that with 30 percent of the overstory removed, natural regeneration of these species will occur (Deal 2002) and some advanced regeneration will take place in the remaining trees. These stands will continue to develop over time and be available for additional future entries (Harris 1999). The next entry is recommended in 40 years. The quantitative effects of single-tree selection for trees over 9 inches DBH for helicopter units in the Navy project are displayed in Tables 6, 7 and 8 in the Silviculture Resource Report.

Uneven-aged management: addresses the following forest health concerns identified in the Affected Environment section:

Wind: Wind risk is not affected, even in high windthrow risk locations, because of the low quantity of timber harvested.

Dwarf mistletoe: Uneven-aged systems are not effective in treating mistletoe. Particularly with a preference to leave hemlock, it is able to infect the understory.

Alaska yellow cedar decline: The effectiveness of this system is the same as even-aged and two-aged management; however, it may not capture the full value of the remaining trees that continue to decline.

Stem decay: Uneven-aged management is not effective in treating stem decay. By retaining 70 percent of the stand, a significant portion of the stem decay remains in the stand. In addition, both future volume loss and increased infection would be expected due to logging damage to the residual stand.

Porcupine damage: Uneven-aged management is an effective way to minimize porcupine damage. By retaining at least 70 percent of the stand, summer forage does not develop rapidly. In addition, the larger trees are less susceptible to porcupine attack.

Effects by Alternative

Alternative A (No Action)

This alternative proposes no timber harvest activities at this time. Silvicultural treatments and harvest prescriptions in this area are deferred to a later date. These stands at this time would not contribute to the Forest's even-flow sustained-yield timber resources and contribute to the local timber economy.

Current levels of fungal decay and mistletoe will likely be maintained in the stands. Net volume growth will continue to be static or declining, due to the stand's age, density, and health. Without silvicultural treatment of these stands, these conditions will likely persist until a major wind event replaces the stand with a new cohort of trees. Some high wind-hazard stands are likely to experience large-scale stand-replacing events in the next decade, resulting in more structure in the early, even-aged stage of development. Other stands would likely experience moderate disturbance resulting in more two-aged structures. Stands more protected from wind are likely to continue experiencing individual tree mortality and gap-phase disturbance processes resulting in continued old-growth structures. The habitat for porcupine (new openings of young trees) will not increase beyond that created by natural events, and the population should decrease as the past clearcuts grow older and larger.

Alternatives B, C, D, E, and F

The alternatives that treat more acres of with even-aged silvicultural systems are generally more favorable for meeting the objectives and desired conditions of project-area development LUDs by providing a variety of age classes, improving timber productivity, encouraging desirable species, protecting forest health, and minimizing cost to improve economics. In all the action alternatives, forest health would be improved by targeting the removal of dwarf mistletoe-infected trees and by creating younger, faster-growing forests or reducing stand densities. Potential windthrow mortality would be captured in even-aged managed units. All of the action alternatives contain units proposing even-aged management. See Table 3-24 for a comparison of acres harvested by alternative and silvicultural system.

Two-aged (15 percent retention) also improves timber productivity, addresses forest health issues (except wind and porcupine), and provides another age class economically. However, two-aged systems are not as effective as even-aged for managing mistletoe and stem decay. Only Alternative C proposes some two-aged management.

Uneven-aged management does not significantly alter stand structure or species composition, and forest health issues are generally not improved. Economics are generally poorer, since helicopter yarding is used, which is more expensive than cable yarding. Uneven-aged management is prescribed for those units where it is not feasible to build NFS road due to economics, or where various amounts of retention are desired to address resource concerns such as wildlife and riparian habitat, or scenery impacts. All the action alternatives contain units where this system is used. Alternative E has a high percentage of uneven-aged management, since this alternative builds no new NFS road, instead helicopter yarding much of the timber volume.

See also the alternative maps at the end of Chapter 2, which display the prescriptions by unit for each of the alternatives.

Table 3-24
Acres Harvested by Alternative and Silvicultural System

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Even-aged	0	1,207	2,185	1,180	487	559
Two-aged	0	0	268	0	0	0
Uneven-aged (STS)	0	2,005	3,654	1,189	2,839	692
Total Acres	**0**	**3,212**	**6,107**	**2,369**	**3,326**	**1,251**

Source: GIS: navy\alternatives. mdb\altpolys (alt_x_rx)

Effects of Road and LTF Construction

Road construction, log transfer facilities (LTFs) and landings will have minor effects from a silvicultural point of view. Acres impacted by these activities will be converted to a non-forested condition. If these acres are left to regenerate, prolific alder regeneration will occur. Over time, conifers will become established on the roadbed, landings, and log transfer facilities, these areas will experience rapid growth as the alder matures and begins to die.

Cumulative Effects

The cumulative effects analysis area includes all Etolin Island, except for the South Etolin Wilderness area. This area includes all lands that have the potential to be

affected by timber harvest. This analysis includes both past activities and management activities within the foreseeable future.

Timber harvest on the island first occurred along the beach fringe around 1914, and continued through the 1970s, with large-scale clearcut harvest beginning in the early 1980s. To date, 6,646 acres have been harvested on the island, and only 6 percent of the original productive old growth (POG) and 13 percent of the original POG in development LUDs (Etolin Landscape Assessment 2006). All these harvested acres are in early successional stages of stand development (stand initiation and stem exclusion). Approximately 949 acres of young growth are over the age of 65, with 792 acres that were even-aged harvested. The Navy Timber Sale proposes harvesting an additional 1,251 to 6,107 acres of the original productive forest land in development LUDs) depending on the alternative.

To assess future effects, 5 years was chosen, given the inherent future uncertainty, as the reasonably foreseeable future. Since the Draft EIS was published, the Red Mountain Timber Sale, consisting of 5.89 MBF of helicopter-yarded saw timber from 639 acres, was sold and completed in the fall of 2007. This sale was located entirely outside of the Navy project area. Within the next 5 years, three other small timber sales may be implemented on Etolin Island. The first is the Fishtrap Salvage Sale located along the NFS 51540 road by Fishtrap Creek, which was sold in June 2007. This sale authorizes the roadside harvest of approximately 208 MBF of cedar decline and windthrown saw timber and utility volume from 240 acres. The second is the Porcupine Salvage Sale authorizing the harvest of 766 MBF of windthrown saw timber and utility volume from 26 acres. This sale was sold in January 2009. The third timber sale is the North Etolin Salvage Sale located along NFS road 6549. It authorizes the roadside harvest of approximately 200 MBF of cedar decline and windthrown timber. This sale had a decision in August 2008 and is outside of the Navy project area.

A project proposal for the Wrangell District Roadside Timber Sales was added to the SOPA in January 2009 and scoping has begun. This project is designed for multiple small timber and fuelwood sales and microsales. It would harvest up to 5 MMBF of salvage and green timber along the existing road systems on Wrangell, Zarembo, and Etolin Islands over multiple years. This project would not substantially alter the forested considion for the project area and would only affect those areas adjacent to exisitng roads.

All of the past harvested stands on Etolin Island have been successfully regenerated with either natural regeneration or with planting and natural regeneration. A total of 306 acres of young growth have been precommercially thinned on the island (FACTS database). This includes thinning for wildlife habitat enhancement and timber production. An additional 522 acres of young growth is planned or proposed to be thinned in the next 5 years. The precommercial thinning should increase stand health and improve wind hazard ratings but does not contribute to the Navy Timber Sale unit stand health or wind hazard ratings. Risk of porcupine damage will be evaluated prior to thinning operations.

Monitoring

All even-aged and two-aged harvest areas are prescribed to be restocked to conifer trees by natural regeneration. Regeneration (stocking) surveys will be conducted on all units after the third full growing season following completion of logging. Four units (37, 58, 60, and 61) will be planted with Alaska yellow-cedar to minimize porcupine damage and insure tree diversity. Plantation (survival) surveys will be conducted on all units after the first and third full growing season following completion of planting.

All uneven-aged harvest areas will be monitored for the regeneration of a new tree layer in the third year post harvest.

Soils

Introduction

Timber harvest and associated road construction can result in changes in soil productivity. The purpose of this analysis will be to describe these potential effects per alternative by discussing the changes in soil productivity caused by road and harvest activities. Three measurement criteria were chosen to evaluate the effects to soils: 1) the amount of timber harvest on slopes over 72 percent gradient in harvest units, 2) the amount of temporary and NFS road built, and 3) the amount of roads on slopes steeper than 67 percent gradient in the project area.

Soil Quality Standards (R-10 Supplement 2500-92-1) and Forest Plan Standards and Guidelines (FP 4-64 to 4-67) have been established to meet the direction in the National Forest Management Act of 1976 and other legal mandates. The guidelines were developed to ensure that management activities will be accomplished without incurring permanent impairment to soil productivity.

The basic information for characterizing soil in the project area is the Draft Soil Resource Inventory Report for the Stikine area (Krosse, 1999). LIDAR (*Light Detection and Ranging*) data was used to derive slope information where it was available in the project area. Where it was not available, a 30-meter digital elevation model was used.

Analysis Area

The analysis area for direct and indirect effects for the soils resource is the harvest units, and associated NFS and temporary roads. This area was selected because it is anticipated that direct and indirect impacts related to this project will be confined to the harvest units and roads. The analysis area for cumulative effects for the soils resource is the project area. This area was chosen because there are no off-site effects.

Summary of Effects

Productive forest soils may be affected by yarding disturbance, skid trails, construction of roads, landings, and rock pits, or management-induced landslides with this timber sale project. The amount of yarding disturbance is not expected to affect adversely either short-term or long-term productivity. The disturbance associated with the helicopter harvest using the single-tree selection is anticipated to be much less than those areas clearcut with cable yarding. All soil-quality monitoring on the Tongass indicates that soil disturbance within harvest units will be less than 5 percent of the harvest unit.

Most of the adverse impacts to soil productivity are expected to result from road construction. Road construction and rock pit development decrease soil productivity because land is taken “out of production”. Total area impacted by road construction in Alternative C is by far the highest, being two to six times as much area as the other alternatives. Road construction on steep slopes (greater than 67 percent) poses a risk for inducing mass movement events. Road construction on steep slopes will be avoided to the extent possible; however, Road 51442 and the temporary road into Unit 44 have short sections.

Best management practices (BMPs) that minimize soil disturbance will be used to maintain soil productivity. Using the procedure specified in the Forest Plan, harvest

units with steep slopes have been reviewed and assessed. However, there is still a risk of mass movement when logging on steep slopes due to changed conditions of factors that contribute to slope stability.

Affected Environment

Soil Productivity

Soils in the project area range from moderately deep, well-drained soils that support productive forests to very poorly drained organic soils that support muskeg vegetation. Soil productivity in the project area is primarily a function of soil drainage and in some cases soil depth. Most soils are covered with an organic mat or duff layer that is 6 to 10 inches thick. This organic mat prevents erosion of the underlying mineral soil from raindrop impact and supplies many nutrients available for plant growth. Keeping the organic mat in place during management activities is a key to preventing soil erosion and maintaining soil productivity.

Soil productivity is the inherent capacity of a soil to support the growth of specified plants, plant communities, or a sequence of plant communities. Soil productivity directly or indirectly affects the productivity of other forest resources. In Southeast Alaska, soil productivity, in terms of tree growth, is high on well-drained soils and decreases as drainage becomes poorer. Principle soil characteristics related to soil productivity are soil depth, soil drainage, bedrock material, and coarse fragment content. The most productive forest sites occur on colluvial footslopes and alluvial fans or floodplains where soils are deep and well drained.

The Region 10 Soil Quality Standards (FSM 2500 R-10 Supplement 2500-92-1) establishes threshold limits of detrimental soil properties. It defines detrimental soil conditions for such properties as soil compaction, puddling, displacement, etc. It is assumed that long-term soil productivity is maintained if these soil properties remain within the standards.

Soil Disturbances

Landslides

Landslides, road construction and logging disturbances are the primary factors contributing to detrimental soil disturbance. Landslides are commonly associated with windthrow events. This is attributed to saturated soils and the soil disturbance caused by rocking trees, which eventually topple over. Shallow depressions of “swales” on hill slopes are a common point of origin for landslides (Swanston, 1994). Water accumulates in the depression resulting in buildup of excess hydraulic head and slope failure. Landslides are common on the west coast of Etolin Island in areas exposed to strong winds and having steep slopes.

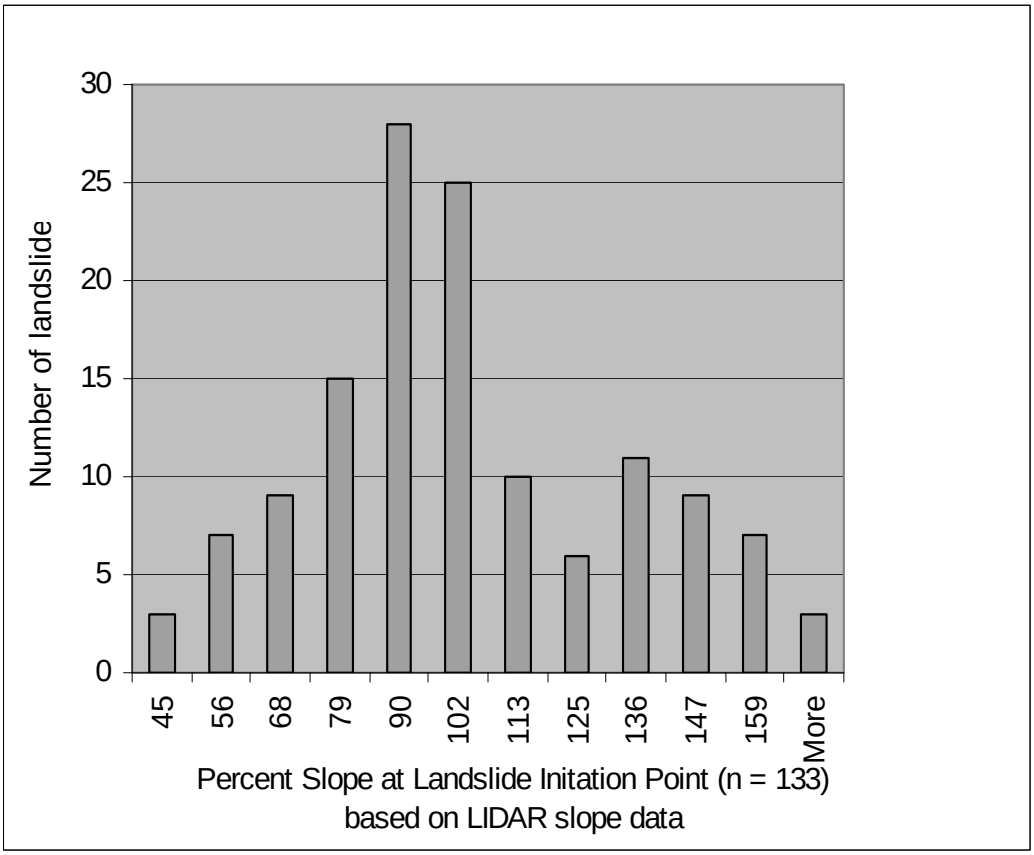
Landslides, both naturally occurring and management-related, dominate soil movement processes on steep forest lands in Southeast Alaska. Landslides deliver eroded material to streams more quickly and in greater quantity than surface erosion. Soil productivity is decreased in the landslide tract. However, the deposition zone typically provides a new productive growing site.

Slope stability can be viewed as the ratio of shear stress (downward force of gravity) and shear strength or resistance to sliding. Timber harvest can contribute to slope instability on steep slopes by decreasing the rooting strength factor of shear strength. Typically, the effects of loss of rooting strength are seen 5 to 15 years after harvest (Swanston, 1969). A study of landslides occurring between 1963 and 1983 by Swanston and others found that roughly 10 percent of the landslides occurred in

harvested areas or were directly associated with timber harvesting, whereas roughly 90 percent happened in unlogged areas. On a per-acre basis, landslides occurred in clearcut areas about three times as frequently as in unlogged areas. Landslides in unlogged areas were found to be larger and longer than those in logged areas.

An analysis of landslide initiation zones in the project area was conducted using the existing landslide inventory and LIDAR slope information. Figure 3-15 displays the slope at the landslide initiation point. Most of the slides initiated on slopes between 80 and 110 percent slope. Only four landslides were found to have initiated in a harvested area. Three slides initiated upslope of a harvest and deposited material in a harvest unit. A large landslide occurred in Unit 47 in October 2007, thus the eastern-most setting was dropped. Some sediment was directly deposited in fish habitat of Pump Creek. No salvage of the debris pile is proposed due to the large amount of sediment that is trapped with the timber.

Figure 3-15
Slope of Landslide Initiation Points



Source: Wrangell Ranger District LIDAR slope data

Road Construction

NFS road construction and rock pit development decrease soil productivity because land is taken "out of production". Within the analysis area, 356 acres of forestland are now covered by roads and rock pits. There are approximately 46 miles of NFS roads covering 281 acres and 8 miles of temporary roads covering 48 acres. There are also 54 rock pits covering 27 acres.

Roads on Slopes Greater Than 67 Percent

Existing roads in the project area are primarily located on gentle terrain. Using the digital elevation model and LIDAR slope data, we found 0.75 mile of road has been constructed on slopes steeper than 72 percent. There were 15 segments with an average length of .05 mile. Two segments have been identified for reconstruction on the 6543 and 51421 roads with this project.

Environmental Effects

Timber harvest with cable yarding or shovel yarding will result in some soil disturbance. Unit cards designate site-specific practices to minimize disturbance (BMP 13.9). Suspension of logs is required in some cable units. All shovel logging operations will use a slash mat to support the equipment to prevent excessive rutting and soil displacement.

Monitoring data (Landwehr and Nowacki, 1999) indicate that areas logged with partial or full suspension typically have less than 5 percent of a harvest unit with detrimental soil disturbance. Based on this monitoring data, it is not likely that yarding practices will result in soil disturbance that exceeds the Region 10 Soil Quality Standards. Individual unit cards specify the yarding requirements. The amount of yarding disturbance is not expected to adversely affect neither short-term nor long-term productivity.

In planning harvest units and road locations, efforts were taken to avoid areas with highly erosive soil and areas with a high risk for mass movement. Best management practices (BMPs) are applied to all land-disturbing activities to protect the beneficial uses of water and soil. Best management practices, specified on unit and road cards, that will help protect soil productivity include the following:

- Partial suspension of logs (lead end of log is suspended above the ground) is to prevent excessive displacement of nutrient-rich surface soil layers (BMP 13.9).
- Full suspension of logs (both ends of the log suspended above the ground) by skyline cable systems or helicopter yarding is designated where needed to prevent excessive erosion or landslides (BMP 13.9).
- Shovel yarding may be designated on gently sloping sites. Use of puncheon may be required to minimize rutting and reduce soil disturbance (BMP 13.9).
- Roads are designed to maintain the natural drainage pattern to prevent excessive instream erosion and detrimental changes in soil drainage (BMP 14.3).
- When bare mineral soil is exposed by management activities, erosion control practices will be implemented to prevent soil erosion and sedimentation (BMP 12.17).
- Blasting in areas with potential for mass wasting is restricted after heavy rainfall when soils are saturated to reduce risk of mass wasting (BMP 14.7).

Direct and Indirect Effects

Harvest Unit Acres on Slopes Greater than 72 Percent

Timber harvest on steep slopes poses a risk for management-induced soil disturbance. Units with slopes exceeding 72 percent were identified using LIDAR information and a 30-meter DEM. The Forest Plan allows decision makers to harvest timber on slopes of 72 percent or greater on a case-by-case basis, based on a slope stability assessment (Forest Plan, page 4-65). A risk-slope-stability-assessment was made of each unit based on aerial photo interpretation and field information. Results of those slope stability assessments are in the project file. Risk is based on a number of factors including site conditions, intensity of disturbance (prescription), and yarding method.

Harvest on steep slopes is proposed in 47 harvest units. Sixteen of these units will have a single-tree-selection (STS) prescription with helicopter yarding; the other units will be logged with a ground-based cable system.

All unstable slopes will be excluded from harvest units during layout. All areas with slopes steeper than 85 percent will be excluded from helicopter harvest units during implementation. Table 3-25 (below) displays the total number of acres included in harvest units by prescription. This table includes the acres that have been approved in addition to acreage that will be dropped during layout.

Full suspension provides surface protection for soils during the yarding process in helicopter units. Partial cutting prescriptions (retaining 70 percent of the stand) would ensure an adequate amount of live root mass remains intact to preserve slope stability. Maintaining the forest canopy will minimize change in hydrologic condition associated with canopy rainfall interception. It is anticipated that helicopter harvest with 70 percent retention will have little effect on slope stability.

Units 72 and 107 have a clearcut with reserves prescription, retaining 50 percent of the unit in a continuous block. Harvest areas in these units will be located to avoid the areas with slopes over 72 percent.

The disturbance associated with the helicopter harvest using the single-tree selection is anticipated to be much less than those areas clearcut with cable yarding. All clearcut cable units pose an increased risk for mass movement, even with sites with highest potential for failure having been removed from harvest units.

Alternative Comparison

Alternative A would pose no additional potential for management-induced detrimental disturbance. When comparing only the clearcut and clearcut with 15 percent retention, Alternative C poses the greatest potential for management-induced detrimental disturbance with 50 acres of clearcut cable harvest on slopes greater than 72 percent. Alternatives D and B follow, with 36 and 31 acres respectively. Alternatives E and F have the fewest acres (14 acres each) of clearcut cable harvest on slopes greater than 72 percent, and would pose the least potential.

Table 3-25
Harvest Unit Acres with Slopes >72 Percent by Prescription

Harvest Prescription [1]	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Clearcut	15	37	20	8	9
Clearcut with 15% reserves and Two-aged	16	13	16	6	5
Clearcut with 50% reserves	14	14	14	0	4
Single-tree selection	132	250	72	148	37

[1] STS-single tree selection retaining 70 %
This table includes the acres that have been approved in addition to acreage that will be dropped during layout.
Source: GIS: J:fsfiles\office\gis\navy\alts\alternatives83.gdb:altpolys_tlmp_rev and J:fsfiles\office\gis\navy\covers\Etolin83.gdb:slope72combo

Road Construction

Most of the adverse impacts to soil productivity are expected to result from road construction. Soil erosion is increased by the destabilization effect of cut and fills and the removal of vegetative cover.

Table 3-26
Estimated Acres[1] of Productive Forest Land Affected by Road Construction

Road Type	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
NFS	40.0	73.2	29.0	13.1	2.9
Temporary	34.5	86.1	29.1	13.9	19.4
Rock Pits [2]	6.2	13.1	4.8	2.2	1.8
Total Acres	**80.7**	**172.4**	**62.9**	**29.2**	**24.1**

[1] Acre conversion is based on 50 ft road width, which would include pullouts and turnouts.
[2] Rock pits are estimated at .5 acre per mile of road.
Source: J:fsfiles\office\gis\navy\alts\alternatives83.gdb:allrds_tlmp_rev J:fsfiles\office\gis\navy\covers\Etolin83.gdb:soils

Table 3-26 displays the amount of productive forestland taken out of productivity due to the construction of the transportation system. Total area impacted by road construction in Alternative C is by far the highest, being two to six times as much area as the other alternatives. Alternatives E and F are lowest with only 34 and 32 acres impacted. Alternative B and D are intermediate with 92 and 73 acres impacted.

Temporary road construction for this project will impact an estimated 14 to 86 acres of productive forest lands, depending on which alternative selected. Alternative C will impact 86 acres, the highest amount of disturbance from temporary road, followed by Alternatives B and D.

Soil quality standards for individual harvest units consider the placement of rock fill for construction of temporary roads a detrimental soil disturbance. All units are expected to have less than 15 percent detrimental soil disturbance due to road construction. Over time, vegetation recolonizes temporary roads and site productivity improves, though site conditions are changed to a less-productive site. Landslides and

windthrow may negatively affect soil productivity by accelerating soil erosion; the amount is not quantifiable but is expected to be relatively low.

Roads on Slopes Greater Than 67 Percent

Forest Plan Standards and Guidelines (Forest Plan page 4-65) direct us to avoid locating a road on slopes steeper than 67 percent, where feasible. Roads constructed on steep slopes typically pose a high risk for initiating landslides and potential for an increased amount of soil erosion. The 51442 road and the temporary road into Unit 44 are the only roads that would be partially constructed on slopes >67 percent. Both roads have only a short sections (<300 feet) across steep slopes.

This project proposes construction in two areas where slopes are steeper than 67 percent - the roads accessing Units 44 and 80. The temporary road accessing Unit 44 crosses a short steep slope with highly erosive fine-grained glacial lacustrine material after crossing upper Pump Creek. Slope failure could result in direct delivery of sediment to the fish stream. This section of road will require immediate cutslope stabilization. The 51442 road is located on an upper hillslope in an area with bedrock control; if there was hillslope failure, it is expected that debris would be deposited in Unit 80 or in the clear-cut below. Slope failure at this site would not be expected to have a direct effect on downstream fishery resources. A stability analysis to determine the most effective and lowest cost method of reducing the risk of roadway failure would be conducted prior to construction.

Full bench construction and end haul of overburden will be required when constructing these roads. Even with these practices, there is potential for slope failure. Alternative C is the only alternative that proposes to build either road.

Cumulative Effects

On the Tongass, there are typically no cumulative effects of timber harvest activities to soils at the stand level. This is because the proposed activity is typically the first entry in the stand, and there are no other proposed ground-disturbing activities, such as prescribed burning, herbicide use, brush piling or disposal.

At a project level, cumulative effects are viewed as a summation of the disturbance or potential soil disturbances in the project area. Events that may result in cumulative effects on soil resources in the project area include past and future timber harvest silvicultural treatments, road construction, and landslides. There are two small timber sales planned in the project area. Within the next 5 years, three other small timber sales may be implemented on Etolin Island. The first is the Fishtrap Salvage Sale located along the NFS 51540 road by Fishtrap Creek, which was sold in June 2007. This sale authorizes the roadside harvest of approximately 208 MBF of cedar decline and windthrown saw timber and utility volume from 240 acres. The second is the Porcupine Salvage Sale authorizing the harvest of 766 MBF of windthrown saw timber and utility volume from 26 acres. This sale was sold in January 2009. The harvest areas have been field reviewed, and there were no issues related to soil resources.

A project proposal for the Wrangell District Roadside Timber Sales was added to the SOPA in January 2009 and scoping has begun. This project is designed for multiple small timber and fuelwood sales and microsales. It would harvest up to 5 MMBF of salvage and green timber along the existing road systems on Wrangell, Zarembo, and Etolin Islands over multiple years. This project would affect those areas adjacent to the roadside; the effects to soils have not been analyzed at this time.

Road construction results in loss of soil productivity and contributes to soil erosion. Table 3-27 displays the amount of productive forestlands taken out of productivity due to both existing and proposed road development

Table 3-27
Cumulative Acres[1] Affected by Road Construction

Road Type	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
NFS road	280.6	320.6	353.8	309.6	293.7	283.5
Temporary	47.9	82.4	134	77	61.8	67.3
Rock Pits [2]	27	33.2	40.1	31.8	29.2	28.8
Total Acres	**355.6**	**436.3**	**528**	**418.5**	**384.8**	**379.7**

[1] Acre conversion based on 50 ft road width, which would include pullouts, turnouts.
[2] Rock pits are estimated at 0.5 acre per mile of road.
Source: J:fsfiles\office\gis\navy\alts\alternatives83.gdb:allrds_tlmp_rev
J:fsfiles\office\gis\navy\covers\Etolin83.gdb:soils

Subsistence

Introduction

This analysis tiers to the 2008 Forest Plan Final EIS (USDA 2008 pp. 3-419 through 3-436) and the 1997 Forest Plan Final EIS, Appendix H. Refer to the both Forest Plan Final EISs for in-depth discussions on the history of subsistence use and community information. Forest Plan Standards and Guidelines for subsistence are pages 4-68 and 69. Since all rural residents qualify for subsistence activities, both Native and non-Native, subsistence use is not the same as Native cultural and traditional use even though overlap occurs.

Alaska National Interest Lands Conservation Act (ANILCA)

The ANILCA, passed by Congress in 1980, mandates that rural residents of Alaska be given a priority for subsistence uses of fish and wildlife. Section 810 of ANILCA requires the Forest Service, in determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of NFS land in Alaska, to evaluate the potential effects on subsistence uses and needs, followed by specific notice and determination procedures should there be a significant possibility of a significant restriction of subsistence uses.

The R10 FSH 2090.23 section 04 definition of "significant possibility of a significant restriction of subsistence uses" is as follows:

"A proposed action shall be considered to have a significant possibility of a significant restriction of subsistence uses, if after any modification warranted by consideration of alternatives, conditions, or stipulations it can be expected to result in a substantial reduction in the opportunity to continue subsistence uses of renewable resources."

Considerations of abundance and distribution, access, and competition (by non-rural residents) are mentioned. The U.S. District Court Decision of Record in Kunaknana v. Watt provided additional clarification. In part, it states, "restriction for subsistence uses would be significant if there were large reductions in abundance or major redistribution of these resources, substantial interference with harvestable access to active subsistence-use sites, or major increases in non-rural resident hunting" (Forest Plan SEIS USDA 2003c, pp 3-172 & 3-173).

Subsistence Resources and Uses

Salmon and other finfish, shellfish, marine plants and mammals, terrestrial wildlife including deer and other mammals, berries, cedar bark, and timber are all subsistence resources harvested by rural communities in Southeast Alaska. Eighty-five percent of rural Southeast Alaska households reported harvesting subsistence food (Kruse and Muth 1990). In 1987, over half of all households reported harvesting more than 80 pounds of edible subsistence foods per person, and a quarter of households harvested more than 250 pounds per person. Almost one-third of rural households obtained at least half of their food from harvest of subsistence resources. By weight, fish and marine invertebrates account for 61 percent of subsistence resource harvest. Deer, other land mammals, and marine mammals represent 21, 4, and 3 percent, respectively, of subsistence harvest (Forest Plan Final EIS, USDA 2008, pg 3-427).

Analysis Area

The analysis area used for subsistence for this project was WAA 1901, since the Forest Plan analysis was by WAA, and ADF&G hunter harvest data is available by WAA, making comparisons and analysis easier than if the Navy project area was used.

Effects Summary

The primary subsistence resource that might be impacted by this project is deer. Based on the 2008 version of the deer habitat model (see Wildlife section in this chapter), Alternative C will have the greatest impact on deer habitat capability and Alternative F will have the least impact, with the other alternatives intermediate in their impacts. The greatest decrease in deer carrying capacity will be the result of past harvest units entering the stem exclusion phase. More than half of the currently open roads are closed under implementation of this project as well as the Wrangell Ranger District Access and Travel Management Plan (ATMP). Over the long term, there is likely to be increased competition for the deer in the remaining road-accessible areas, since it is not anticipated that the number of hunters will not decrease proportionately to the decrease in drivable roads.

Affected Environment

Communities Using North Etolin Island (Wildlife Analysis Area 1901)

The project area for the Navy Timber Sale falls within documented community subsistence use areas for Coffman Cove and Wrangell (2008 Forest Plan Final EIS). They are classified as rural and receive subsistence priorities. The project area is not connected by road to any community. It is located about 22 miles southwest of Wrangell, and about 12 miles northeast of Coffman Cove, and can be accessed only by boat or floatplane.

Although north Etolin Island, including the Navy project area, may be important to some individuals, substantial community use was not documented for any communities prior to 1994 (Forest Plan Final EIS, USDA 1997 Appendix H, pages H-20 -21, H-36-37, H-40-43, H-46 -47, and H-60-61).

Wrangell reported the highest percentage of any community's total deer harvest coming from north Etolin Island at only 1-3 percent (Ibid, page H-61). WAA 1901 was not identified by any community as a location contributing to 75 percent of annual deer harvest (Ibid, pages H-64 to H-95). Since 1996, Wrangell residents have used north Etolin for deer hunting more consistently than residents of any other community. The percentage of Wrangell's total deer harvest derived from WAA 1901, as estimated by deer hunter surveys, fluctuated between 1 percent in 1998, to 15 percent in 1997, and remained less than 10 percent from 1998 to 2003. The average number of deer harvested in WAA 1901 by Wrangell residents, according to ADF&G figures for 1997 through 2003, was about 32 deer a year. While Ketchikan hunters also use WAA 1901 to harvest deer, this WAA accounts for less than 1 percent of Ketchikan harvest (Ibid, pages H-31). According to ADF&G, Ketchikan residents' average deer harvested in WAA 1901 was four per year. Ketchikan is classified as a non-rural community and residents do not have a subsistence priority under ANILCA.

Subsistence Resources

Subsistence Use of Resources Other than Deer

Residents of Wrangell and Coffman Cove harvest king salmon (chinook) , halibut, trout and char, Dungeness crab, and berries, as well as trapping furbearers, in and adjacent to WAA 1901(1997 Forest Plan Final EIS, pages 3-533 and 3-670). Past timber harvest in this WAA resulted in an increase in the abundance of berries, but these are not heavily used since there are no communities on the drivable roads in this

WAA. Although not documented, it is expected that there is a slight increase in competition for these resources with non-subsistence users during logging activities.

Distribution and Abundance of Deer

One estimate of deer abundance in the analysis area is based on the interagency deer habitat model, which estimates and measures change in winter deer habitat. The analysis for this project uses the 2008 version of the deer model. Model results and analysis are described in detail in the wildlife resource report. In addition, this analysis looked at Alaska Department of Fish and Game (ADF&G) deer hunter survey reports and annual pellet count data for trends. On average, a habitat capability of 18 deer/mile^2 is assumed to be necessary to support both predation and hunter harvest (2008 Forest Plan, pg 4-95). The 2008 Forest Plan Final EIS estimated a current density of 16 deer/mile^2, which is confirmed by the model outputs for this analysis (Table 3-29). This would indicate that there could already be a problem with the deer carrying capacity, but this is not supported by the evidence, since both deer and wolves appear to occur in good numbers on Etolin Island, based on field observations and hunter harvest statistics. This could be a result of inability of the model to predict accurately carrying capacity, or it could be that the deer population is not at or near carrying capacity, so a reduction in the latter is not affecting actual deer numbers. There is insufficient data to know if the actual deer population is currently below carrying capacity, and if so, what would be causing this.

Changes in deer distribution and abundance could result from loss of habitat as timber harvest converts old-growth forest into second-growth stands, as well as from predation by wolves and hunters and possibly competition with introduced elk. In the 25 to 30 years following timber removal, harvest units will retain some value as deer habitat by providing a flush of understory forage plants that is expected to be available to deer, except under deep snow conditions. After that time, as stands enter the stem-exclusion stage, harvest units will have almost no value as winter deer habitat (see "Sitka Black-tailed Deer" in the wildlife section. The stem exclusion effect from past harvest would override the short-term increase of forage in new clearcuts.

Pellet count data indicates that deer populations appear to be stable to slightly increasing in Wildlife Analysis Area (WAA) 1901. Information from ADF&G also indicates that deer harvest rates have been stable. Field surveys noted browsing in the project area, but not enough to indicate the deer (and elk) populations were close to carrying capacity or having a negative impact on the habitat. At this time, there is no reason to believe the deer population in the project area is suffering a decline.

Access to Deer

Road networks created for timber harvest provide greater access to areas previously unroaded and can affect subsistence, both positively and negatively, by providing access to previously remote regions, dispersing hunting pressure, and creating the potential for increased competition with non-subsistence users (2008 Forest Plan Amendment Final EIS, pg 3-420). Even roads that are closed to vehicles can improve access for hunters on foot. WAA 1901 currently has 61 miles of roads open to vehicle access, and an additional 20 miles of closed roads. For this project, "open roads" includes any roads currently existing and drivable plus proposed NFS roads based on knowledge of the road system.

Competition for Deer

Increased access provided by roads built for timber harvest can result in increased competition with non-subsistence hunters, as well as increased opportunity. This is

most pronounced on road systems connected to communities, whether directly or via the ferry system. The existing roads in WAA 1901 are not connected to any communities or ferry systems. Wrangell, a subsistence community and the closest community to this area, had the greatest harvest of deer from WAA 1901, but hunters from Ketchikan, a non-subsistence community, also harvested deer there.

Environmental Effects

Subsistence Use of Resources Other than Deer

There may be a temporary increase in competition for subsistence resources in or near Anita Bay from non-rural logging and road building crews during timber harvest activities for any of the Navy action alternatives. After logging activities are completed, the distribution and abundance of, access to, or competition for king salmon, halibut, trout and char, Dungeness crab, and berries are not likely to be restricted by this project. Timber harvest may increase availability of berries in harvest units in the short term, but may decrease availability over the long term. However, the Navy project area is not heavily used for berry picking because there are no communities on the Anita Bay road system. Aquatic and marine subsistence resources are not likely to be significantly impacted by project-related activities. Therefore, it is not expected that a significant restriction of the opportunity for rural communities to continue to harvest these subsistence resources will occur.

The Forest Plan Final EIS (USDA 2008, pp3-419 through 3-436) provided a comprehensive analysis of subsistence resources and potential effects of management activities, both Tongass-wide and for each rural community in Southeast Alaska. That analysis concluded that Forest-wide, under full implementation of the Forest Plan, the only subsistence resource that may be significantly restricted in the future is subsistence use of deer (Forest Plan ROD, USDA 2008, pg. 61). Public comments identified concerns about abundance, access, and competition for deer. Therefore, the remainder of this section focuses on the impacts of the proposed alternatives on the abundance and distribution of, access to, and competition for deer.

Distribution and Abundance of Deer

The actual population of deer within the project area is unknown. The deer model discussed in the wildlife section was used to display the effects of the alternatives on the available deer habitat capability of the project area.

Declines in deer habitat are measurable and would occur under all action alternatives in areas where timber is harvested. Under the alternatives analyzed in this Final EIS, the possibility of a change in abundance varies by alternative (Table 3-29). Some slight localized shifts in distribution could occur because of proposed timber harvest, but this is not expected to change the overall distribution within WAA 1901 or cause mass migration of deer to the adjacent WAA.

Table 3-28
Sitka Black-tailed Deer Habitat Capability Effects by Alternative

		Percent Decline in Habitat Capability [1] by Alternative					
		Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Direct and Indirect Effects [2]	0-25 years	0	2.5	4.4	2.0	2.5	1.0
Cumulative Effects [3]	26-150 years	7.4	10.6	13.1	10.1	10.3	8.7

[1] Based on the 2008 version of the interagency deer model
[2] Reported as percent decline from existing condition.
[3] Reported as percent decline below estimated habitat capability in 1900, to demonstrate cumulative effects of past harvest plus proposed harvest under each alternative.
Source: J:\fsfiles\office\wrd\nepa_projects\navy\06_Resource_Folders\n_Wildlife\References\DeerWaas2008FP_all.xls.

Although deer habitat capability in some areas may increase temporarily in response to increased food availability in harvest units, it is expected that deer habitat capability would ultimately decline approximately in proportion to timber harvest intensity. The deer model does not incorporate all factors known to influence actual deer populations; however, it does provide a tool to compare differences between alternatives. The greatest impact on deer carrying capacity is from Alternative C, which has a 4.4 percent short-term decrease and a 5.7 percent long-term decrease, as compared to the No-action Alternative. While reduced deer abundance could lead to increased competition between rural and non-rural hunters (see below), this level of decrease in carrying capacity is low. The greatest decrease in deer carrying capacity will be the result of past harvest units entering the stem exclusion phase.

Access to Deer

Access to deer would temporarily improve due to roads associated with Alternatives B, C, D, and E. Although all proposed roads and some existing roads would be closed after timber removal is complete, roadbeds could still improve opportunities for walk-in subsistence deer hunting until they became too brushy to be passable. In the short-term, new roads would increase opportunities for subsistence hunting and they would open areas to hunting that historically have been relatively inaccessible. Roads, open or closed, would also increase opportunities for additional hunters, and it is likely that both legal harvest and illegal poaching of deer would increase, especially with an open road system. Increased access to deer may ultimately lead to increased competition for deer between rural and non-rural hunters (see below). In the long term, with full implementation of the Wrangell ATMP, roughly half of the roads in WAA 1901 that are currently open to motorized vehicles will be closed. This will immediately reduce access to motorized vehicles and eventually decrease foot access as these roads close in with dense vegetation. This would increase competition for deer in the areas still accessible by motorized vehicles; since, it is expected that the number of hunters will not decrease as much or as rapidly as the area, that is accessible.

Competition for Deer

As described above, expected declines in deer abundance resulting from timber harvest and the temporary increased access to deer by both rural and non-rural hunters could lead to increased competition for deer. A deer population, at carrying capacity, should be able to support a hunter harvest (demand) of approximately 10 percent that is sustainable and that provides a reasonably high-level of hunter success (1997 Forest

Plan Final EIS, pg. 3-596). Hunter success can be expected to decline in areas where demand represents 10 to 20 percent of habitat capability. If demand exceeds 20 percent of habitat capability, harvest of deer by hunters may be directly or indirectly restricted (1997 Forest Plan Final EIS, pg. 3-537). Table 3-29 displays current and projected hunter demand for deer with respect to deer habitat capability predicted by the 2008 version of the interagency deer model.

The 1997 Forest Plan Final EIS, Appendix H, did not estimate projected demand in WAA 1901 for any community, because this WAA did not substantially contribute to 75 percent of any community's subsistence harvest of deer. According to hunter surveys, deer harvest appears to have dropped since the mid-1990s, and has remained relatively stable the last 5 years. Average deer harvest for 1997-2005 was 39 deer. This analysis assumes a demand of 78 deer per year, which is the maximum number of deer harvested 1997-2005, as estimated by deer hunter surveys (ADF&G 1997-2005). Furthermore, this analysis only estimates effects for 26 years after proposed harvest, and assumes no further timber harvest would take place during that time. Assuming hunter demand does not increase above 78 deer per year, and that no further timber harvest or substantial habitat alteration occurs in the next 26 years in WAA 1901, none of the alternatives would result in hunter demand exceeding 10 percent of habitat capability. This analysis would imply that hunter success should not decline because of changes in habitat capability associated with this sale in the next 26 years.

The human populations of Wrangell, Coffman Cove, and Ketchikan have decreased considerably from 1995 to 2003 (Forest Plan 1997, Community Assessments; Alaska Community Database, Community Information Summary). Wrangell has decreased by about 23 percent, Coffman Cove by 36 percent, and Ketchikan by about 10 percent. If this decreasing population trend continues, or stabilizes, it is reasonable to expect that hunter demand would not, by contrast, increase. Therefore, it is reasonable to conclude that, given the above analysis, harvest of deer by hunters should not be directly or indirectly restricted by competition.

Table 3-29
Estimated Deer Harvest by All Hunters as a Percent of Current and Projected Deer Habitat Capability in WAA 1901

	Estimated WAA 1901 Deer Harvest (% of Deer Habitat Capability)	
	Deer per Square Mile[1]	**% Hunter Demand of Habitat Capability[2]**
Existing Condition in	16.2	2.3%
Year 2033: Alternative	15.8	2.4%
Year 2033: Alternative	15.5	2.4%
Year 2033: Alternative	15.2	2.5%
Year 2033: Alternative	15.5	2.4%
Year 2033: Alternative	15.7	2.4%
Year 2033: Alternative	15.7	2.4%

[1] Based on interagency deer model
[2] Percent harvest is based on short-term (0-25 year) impacts, and assumes 78 deer per year, based on 1997-2005, maximum estimated deer harvest estimated from ADF&G hunter survey.
Source: J:\fsfiles\office\wrd\nepa_projects\navy\06_Resource_Folders\n_Wildlife\References\DeerWaas2008FP_all.xls.

Habitat capability under all of the alternatives, both short term and long term, would be slightly less, with the greatest reduction from Alternative C, with an estimated 14.8 deer/mile^2 over the long term (Table 3-29). While this is not a very high decline in carrying capacity over the current condition, there may still be increased competition between hunters due to uncertainty in the deer model (see the Wildlife section of this chapter) for use in predicting effects to wolves and hunters. As a result, hunter effort may increase to obtain the same number of deer or hunter success may decrease. Impacts from reduced habitat carrying capacity would likely be more apparent after extend periods of heavy snow or if actual deer (and elk) population numbers approach carrying capacity, which does not appear to be the case at this time.

Increased access created through new road construction under some alternatives has the potential to temporarily increase competition between rural and urban hunters, particularly in areas like Cooney Cove where road access was previously not available. However, a risk of a significant restriction on subsistence use of deer is not expected as a direct result of this project. This determination was made because hunter demand is not high, all proposed roads are to be closed after logging, and the WAA has not been reported as an important WAA to any one community (less than 10 percent of Wrangell deer harvest is from this WAA),. The long-term impact of closing roughly half of the open roads to motorized access, plus a slight reduction in deer carrying capacity, may lead to restrictions in subsistence use of deer in WAA 1901 due to reduced access.

Finding

Consistent with Section 810 of ANILCA, the alternatives were evaluated for potential effects on subsistence uses and needs, as described above. Based on that evaluation and ANILCA definitions of significance, it was determined that, in combination with other past, present, and reasonably foreseeable future actions, all of the action alternatives could result in a slight increase in the possibility of a significant restriction on subsistence use of deer.

Most increases in competition would be due to reduced deer habitat carrying capacity due to past harvest units entering the stem exclusion phase and a reduction in access from road closures implemented for the Wrangell ATMP. To a lesser extent, proposed road closures for this project and decreases in deer habitat capacity from timber harvest with this project would add only a slight increase to this possibility of a restriction on subsistence use of deer, with the greatest potential for impacts from Alternative C.

This is consistent with the cumulative determination in the Forest Plan which stated that 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 these resources, and on competition for these resources (2008 Forest Plan ROD, pg. 60-61). None of the Navy Timber Sale alternatives would result in a significant possibility of a significant restriction on any other subsistence resources and uses.

A subsistence hearing was held in Wrangell on June 26, 2008. Residents of Coffman Cove were also scoped via flyers after publication and dissemination of the Draft EIS. We received no comments from Coffman Cove residents, and no one from the public attended the subsistence hearing held in Wrangell.

Transportation

Introduction

This section discusses transportation management; the existing transportation system for the Navy project area, including roads and marine access facilities (MAFs); and how the addition of proposed roads affect the Anita Bay road system. It will also demonstrate how all alternatives comply with the Wrangell Ranger District Access and Travel Management Plan (ATMP). The effects of road construction on various resources are discussed within the respective resource sections.

Analysis Area

The direct, indirect, and cumulative effects analysis area is identical to the project area. The area was selected because the Anita Bay and other proposed road systems reside completely within the project boundary.

Summary of Effects

The proposed roads present typical Southeast Alaska road construction challenges and do not offer constructability concerns. The roads will be constructed using linear grading design and specifications. All applicable BMPs will be implemented. The activities proposed for road construction and maintenance in this project respond to Forest Plan goals and objectives to protect water, soil, fish, and other resources. All new road locations and design would meet Forest Plan Standards and Guidelines (Forest Plan, pages 4-80 through 4-87). Stream-crossing structures would be designed to meet safety and resource concerns. The selected alternative of the ATM is completely compatible with any Navy Timber Sale alternative.

Addition of NFS Road 51451

Between Draft EIS and Final EIS, the 0.48-mile road to access units 103 and 104 was changed from temporary to NFS road. A temporary road is proposed from the end of Road 51451 to access Unit 106.

Transportation Management Definitions

Road Access Management

Forest roads in this project are classified as NFS roads and temporary roads by 36 CFR 212.1. The definitions and additional information are shown below.

NFS road: "A forest road other than a road which has been authorized by a legally documented right-of-way held by a state, county, or other local public road authority."

NFS roads provide long-term or intermittent motor vehicle access. These roads receive constant or intermittent use depending upon the timing of timber harvest(s) and other activities. NFS roads form the primary transportation network in the project area.

Temporary road or trail: "A road or trail necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or trail and that is not included in a forest transportation atlas."

Temporary roads are intended for short-term use and maintained for a limited time, usually to access a timber harvest unit. Temporary roads are decommissioned after a timber harvest. Road decommissioning activities result in the stabilization and restoration of unneeded roads to a more natural state. The term generally refers to

temporary roads constructed for timber harvests that have had stream courses restored, culverts removed, waterbars added where needed, and cut and fill slopes re-vegetated.

Road Maintenance

Road maintenance consists of superficial periodic repairs to an existing road surface, brushing, cleaning, and repairing drainage features. These tasks are performed to keep the roads in the safe and useful condition for which they were designed. Repairs may be accomplished as annual maintenance.

In this document, road reconstruction refers to heavier maintenance of an existing road, such as culvert replacement, surface rock replacement, and subgrade repair.

Road maintenance consists of performing the work necessary to retain the road's traffic service level. The amount and level of maintenance and repair is dependent upon road management objectives and maintenance criteria.

Roads are often built and operated at a higher maintenance level during the timber sale than they are afterwards. The **operational maintenance level** is the maintenance level assigned to a road during the timber sale. The **objective maintenance level** is the maintenance level assigned to the road after timber harvest. It considers future road management objectives, traffic needs, budget constraints, and environmental concerns.

Maintenance Levels (MLs) discussed in the Road Management Objectives (RMOs) includes MLs 1 and 2. The definitions for MLs are contained in FSH 7709.58. The purpose of the MLs is to define the level of service provided by, and maintenance required for, a specific road or road segment.

- ML 1. Assigned to intermittent service roads during the time they are closed to vehicular traffic. Emphasis is normally given to maintaining drainage facilities and runoff patterns.
- ML 2. Assigned to roads open for use by high-clearance vehicles. Passenger car traffic is not a consideration. Log haul may occur at this level.
- MLs 3, 4, and 5. Maintained at various levels of comfort for a driver in a standard passenger car. These maintenance levels do not occur on Etolin Island.

It should be noted that the ML 1 level of closure is different than the one defined in the Alaska Forest Resources and Practices Act (AFRPA). Throughout this document, when road closure is discussed, it is referring to the definition above, which could fit in either the AFRPA "inactive" or "closed" definition.

Affected Environment

Anita Bay, where most of the road system begins, is located about 25 miles south of Wrangell, Alaska. Etolin Island's transportation system is remote; there are no private landowners along the road system. The road system has no direct land-based access from communities. Access for motorized vehicles on the Etolin Island road system is obtained by taking an off-highway vehicle (OHV) by private boat or barge to a marine access facility (MAF). The Anita Bay MAF consists of two sites: Anita Bay South, a log transfer facility (LTF), and Anita Bay North, an equipment-loading log bulkhead and adjacent dock. These two sites provide access to the Anita Bay road system. A map that shows the current and proposed road system is contained in the

Transportation Report and at the beginning of the Road Cards (Appendix C in the Draft EIS).

The NFS roads were built for logging and the associated administration, though substantial recreational and subsistence use occurs primarily during the spring, summer, and fall. All of the roads fall under Forest Service jurisdiction. The project area has approximately 50 miles of NFS roads.

The road system within the project area began in 1983, with the construction of the Anita Bay LTF and nearby road segments. Soon after it was built, timber harvest associated with the road system began. By 1986, the road system stretched toward Burnett Inlet, Mosman Inlet, and Kindergarten Bay. In 1993 and 1994, the miles of road increased dramatically as the 51540 road was constructed to access timber in the Fishtrap Creek valley. Also in 1994, the road system was extended along the southeast side of Anita Bay to within one quarter mile of the Olive Cove road system (6172 road), which lies outside of the project area.

Roads Analysis

The roads in the Navy project area were analyzed in the Wrangell Ranger District Roads Analysis (RA) (USDA 2006d). This analysis was completed in August 2006. The analysis identifies issues specific to the road system.

The RA listed many problems with the roads maintenance, which had been ongoing, and some of the road maintenance problems have been corrected. Additional work is ongoing (see the cumulative effects section) to correct maintenance problems. This work was authorized under the Wrangell Ranger District Access and Travel Management Plan EA. The Finding of No Significant Impact and Decision Notice was signed on August 3, 2007.

Environmental Effects

The alternatives propose up to 12.0 miles of NFS roads, and up to 15.7 miles of temporary roads. Temporary roads would be decommissioned after the timber sale. Only Alternative C proposes to build all the described roads.

Alternative A would not change the current road system. Alternative C proposes the maximum new road system considered. Alternatives B, D, E, and F offer a mix of NFS and temporary roads. Table 3-30 displays the type of road construction and number of miles by alternative.

Table 3-30
Miles of Proposed Roads by Road Type and Alternative[1]

Road Type	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
NFS Road	0.0	6.6	12.0	4.8	2.2	0.5
NFS Road Reconstruction	0.0	0.9	3.2	0.4	2.2	2.2
Total NFS Road	0.0	7.5	15.2	5.2	4.4	2.7
Temporary Road	0.0	6.3	15.7	5.4	2.3	4.0
Totals	**0.00**	**13.8**	**30.9**	**10.6**	**6.7**	**6.7**

[1] Actual road lengths (miles) will differ slightly from the totals shown in this table, which were taken from the GIS data.
Source: GIS: j:fsfiles/office/gis/navy/alts/Alternatives. mdb/allroads.

Construction Concerns on Proposed Road

There are no concerns about the constructability of the proposed road system. Typical to any addition to the road system in the Tongass National Forest, there are short sections of full-bench construction (slopes greater than 55 percent) and numerous stream crossings. Portions of the proposed roads have been relocated to avoid rare plants, nest buffers, difficult stream crossings, and high-vulnerability karst that have been found near the preliminary road alignment. Some of these occurred in time to include in the Draft EIS, others, such as the 51009, 51421, and 51442 roads have been changed slightly since the Draft EIS. Please refer to the text under the "Road Location" heading of the individual Road Management Objectives (RMOs) for details. It is possible that similar situations will arise during the implementation process, in which case every effort will be made to find a responsible solution. Changes during layout will be analyzed in the Change Analysis.

In general, resource concerns and mitigation measures identified in the RMOs consist of the following.

- Cutslope erosion will be mitigated by timely erosion control.
- Side slopes of greater than 55 percent will be mitigated by full bench construction and slope stabilization, if necessary.
- Road construction across muskegs will be mitigated by using wetland protection measures.

Additional details of specific road construction challenges, concerns, and mitigation measures are shown in the RMOs located in the Road Cards, Appendix C of the Draft EIS.

All construction and reconstruction of NFS and temporary roads will require the use of rock pits. Where feasible, existing rock pits will be used; however, most new road construction will require the development of new rock pits.

Linear Grading

Linear grading will be used to construct the new NFS roads. Linear grading is a construction tool used to reduce survey and design costs. The result of a road constructed by linear grading on the Wrangell Ranger District is almost identical to normal construction. Originally, the linear grading standard drawings did not contain ditches on a typical side hill section. This has changed, and now ditching is incorporated into linear grading construction. All streams receive adequate structures under the same specifications used traditionally, and major structures (bridges and

large culverts) are still surveyed and designed. The maximum allowable grades for the road have not changed. All applicable best management practices still apply.

The following excerpt is from the Alaska Region (Region 10) Forest Service Specification for linear grading. This section defines the limits of flexibility a road builder has when constructing a linear grading road. Essentially this gives the road builder the flexibility to adjust the road slightly within the clearing limits.

"Do not encroach on stream channels, wetlands, or extend beyond right-of-way or easement limits. Do not make alignment or profile grade adjustments that adversely affect drainage. Construct the roadbed within the following grading tolerances:

(a) Alignment (centerline). Alignment may be shifted a maximum of 20 feet slope distance left or right of the planned centerline. Proposed realignments greater than 20' slope distance must be approved in writing prior to start of construction. Do not construct curves with radii less than 80 feet. Compound curves are permitted. Traveled way tolerance is (+) 2 feet unless otherwise designated.

(b) Profile grade. Profile grade may be shifted a maximum of 5 feet up or down from the plan elevation provided the new grade tangent does not vary more than 2 percent from the plan grade tangent. Connect revised forward and back grade tangents with a uniform vertical curve consistent with the criteria."

For additional clarification of linear grading, there are two linear grading standard drawings and the Region 10 specification for linear grading in the project record under Transportation.

Log Transfer Facilities and Other Associated Facilities

Due to the remote nature of Etolin Island, harvested timber is hauled by log trucks to a LTF, transferred to the saltwater or barges, and towed to a lumber mill.

All timber harvested along the road system associated with Alternatives B, D, E, and F would go through the Anita Bay LTFs, located in Starfish Cove. The great majority of lumber associated with roaded portions of Alternative C would also go through the Anita Bay LTFs as well. However, Alternative C proposes the construction of the Mosman Inlet LTF at Cooney Cove and the associated road system. Dives for the site have been conducted but an engineered design package for the site would not be completed until after a decision is made to enter the area due to the high survey and design cost and limited personnel. Permitting for the site will begin only if Alternative C is selected.

In areas where timber more economically accessible by water than by roads, such as the helicopter units in Burnett Inlet, timber will be slung by helicopter to barges on the water.

The current Anita Bay South Tideland Lease from the Alaska Department of Natural Resources expires January 2010. The leases stipulate that dive surveys must be conducted prior to each operating season for monitoring of bark accumulation, unless a waiver is granted. The last dive at this site was completed in 2000. An Army Corps of Engineers permit was obtained for the construction of the facility. The Anita Bay South permit number is 071-OYD-1-800384. The National Pollutant Discharge Elimination System (NPDES) permit, AK-G70-0014, was issued July 31, 2003, and was to expire March 21, 2005. A new permit has been applied for, but due to a backlog of permit requests, the Alaska Department of Environmental Conservation extended the existing permit administratively until a new permit can be issued.

The Anita Bay North facility was originally constructed as a barge ramp. A subsequent modification in 1995 updated the facilities. The current Anita Bay North Tideland Lease extends to January 11, 2014. The leases stipulate that dive surveys must be conducted prior to each operating season for monitoring of bark accumulation, unless a waiver is granted. The last dive at this site was completed in 2000. There is no authorization to water logs at the north LTF, so no NPDES permit is necessary.

The Alaska Department of Natural Resources is currently working on combining the Anita Bay North and South easements and will eventually submit their proposal for public comments. One of the primary purposes for this effort is to reduce future paperwork.

As part of the logging operations, it is typical that a sort yard, fuel facility, equipment compound, repair shop, and field office will be located at one or multiple LTF sites. Activities with potential for spills of hazardous materials, such as fuel, require Spill Prevention, Control and Countermeasure plans (SPCC). Forest Service environmental engineers will review all SPCC plans prior to any petroleum products being on site. These plans must comply with all State and Federal permits and laws.

Camp facilities could be located either on land or on a barge near an LTF. Existing sites will be used where possible. All camps must obtain the appropriate State permits.

Land and float camps typically include a water supply, garage disposal, and sewage disposal. Water would be sourced from streams. Garbage would be disposed of by incineration, or transported to a municipal disposal site. Land camps' sewage would require an approved drain field or septic tank; a float camp's sewage would be treated prior to discharge into the ocean.

Sort Yards

The primary sort yard associated with the Anita Bay LTF is located on the 6540 road at Mile Post 3.1. It was last used for the Starfish Cove Timber Sale in 1993, and now has alder growing on portions of it. The sort yard is surfaced with rock.

If the Mosman Inlet LTF (associated with Alternative C) were constructed, a sort yard would be necessary. It may be feasible to use the first large developed rock pit near the LTF for log storage/sorting. This would limit environmental impacts and reduce operational costs. It is estimated that 2 acres would provide enough space for short-term storage and sorting.

Road Costs

As one would expect, the estimated road construction cost is roughly proportional to the miles of road. Subsequently, Alternative C is the highest-cost alternative, while Alternative F proposes the least amount of new road compared with the other action alternatives and is the least expensive.

The costs of constructing the temporary roads are included in the table below. These costs are a simplified estimate based on average costs and do not represent a detailed engineer's estimate of the construction costs associated with the proposed roads.

Table 3-31
Summary of Construction Cost by Alternative

	Estimated Road Construction Cost	Average Road Construction Cost per Mile	Average Road Construction Cost per MBF	Average MMBF Harvested Utilizing Road System per Mile of New Road Construction (MMBF/Mile)
Alt. B	$2,039,289.81	$147,774.62	$44.82	3.30
Alt. C	$4,335,727.41	$140,314.80	$49.55	2.83
Alt. D	$1,622,001.98	$153,019.05	$43.60	3.51
Alt. E	$760,808.66	$113,553.53	$19.81	5.73
Alt. F	$603,972.44	$90,145.14	$33.00	3.05

Source: R10 Cost Guide

The purchaser will pay for maintenance on existing and new roads that they use during the life of the timber sale. After the timber sale, the roads are closed. Subsequently the agency's long-term maintenance burden for the new roads is negligible.

Direct and Indirect Effects

Please refer to the road cards in Appendix C of the Draft EIS for additional details about specific roads.

Alternative A

Under Alternative A, there would be no changes in road management. Maintenance and repair activities would continue as previously planned. Road management on Etolin Island would be performed as stated in the ATM EA Decision Notice. We are currently in the process of implementing the ATM EA decision. The Current Condition describes the road system status as of March 2008. Once implementation of the ATM EA is complete, the road system will change as described in the table below.

Table 3-32
Current Miles of Existing Road System (NFS Roads)

	Road Miles		
Status	Decommissioned	ML1	ML2
Current Condition	0	2.5	46.9
After Completed Implementation	0.8	22.2	26.6

Source: GIS: j:fsiles/office/gis/navy\covers\Navy. mdb\road_arcs

Alternative B

Alternative B proposes the construction of 6.6 miles of NFS road and 6.3 miles of temporary roads; additionally, this alternative would require 0.9 mile of NFS road reconstruction. The proposed 1.7-mile extension of the 6547 road enters the Detailer Creek basin, crosses the creek and ends at the junction of two proposed temporary roads. Future harvest along this road is a possibility but future extensions of the road may be impractical because of construction difficulties associated with the terrain forces the road into the beach buffer for over a mile. The proposed 2.5-mile 51009 road segment provides opportunity for current and future harvest; extensions of this road may also be practical.

The 6540, 51403, 51421, and 51451 road segments proposed under this alternative are less than 1 mile in length and are either short extensions of existing roads or new roads starting from the existing road system.

The 6.3 miles of temporary roads built under this alternative would be decommissioned after the timber sale. All proposed roads would be closed at the end of the timber sale. This includes the 0.9 mile of NFS roads that would be reconstructed if this alternative is chosen.

Alternative C

Alternative C proposes the construction of 12.0 miles of NFS road and 15.7 miles of temporary roads; additionally this alternative would require 3.2 miles of NFS road reconstruction. The proposed 1.3-mile extension of the 6540 road would provide opportunities for timber management along the road. With short temporary roads, additional harvest could be considered. Future use will consist of additional timber management. The end of the proposed 6540 road will be bounded by beach buffer to the West and an OGR to the south. The proposed 1.7-mile extension of the 6547 road enters the Detailer Creek basin, crosses the creek and ends at the junction of two proposed temporary roads. Future harvest along this road is a possibility, but future extensions of the road may be impractical because of construction difficulties due to the terrain forcing the road into the beach buffer. The proposed 3.0-mile 51009 road segment provides opportunity for current and future harvest. Opportunity for future 51009 road extensions is unlikely due to beach buffer and the proximity of an OGR. The proposed 1.3-mile segment of the 51442 road climbs up onto the side of a ridge to access timber. Future extensions of this road are possible, although construction may be difficult due to some steep slopes in the area.

The proposed 6555 road begins at an LTF in an OGR. The road makes its way as quickly as possible through the Medium OGR and into Scenic Viewshed and Modified Landscape LUDs. Options for the LTF are very limited. The alternative sites in Cooney Cove had more miles of road in the beach buffer while still entering the OGR. Additionally the alternate road location would have crossed a Class I stream. LTF locations on the Mosman Inlet side were not possible due to the steep terrain immediately above the beach. A road extension from the Anita Bay road system would encounter difficult construction due to steep slopes (over 67 percent) and numerous stream crossings, many with deep notches requiring bridges or large fills. Almost all of the construction associated with this option (over 4 miles) would have taken place in the beach buffer.

The selected site for the 6555 road and associated LTF would construct 0.4 mile of road in the Steamer medium OGR. The clearing limits will be kept to a minimum where possible to limit the impacts to the OGR. On slopes less than 20 percent the clearing limits will be limited to 46 feet wherever feasible. Linear grading road construction will be used. The road provides access to land that would otherwise be inaccessible to conventional logging systems. The total road length extends 2.8 miles and although future extensions of the road are possible, they seem unlikely due to broken ground and relatively low timber volumes. However, there would be opportunities for future harvest along the road.

The 51403, 51421, and 51451 road segments proposed under this alternative are less than 1 mile in length and are either short extensions of existing roads or new roads starting from the existing road system. The 51551 road is proposed as a short 0.3-mile extension off the proposed 6555 road.

The 15.7 miles of temporary roads built under this alternative would be decommissioned after the timber sale. All proposed roads would be closed at the end of the timber sale. This includes the 3.2 miles of NFS roads that would be reconstructed if this alternative were chosen.

Alternative D

Alternative D proposes the construction of 4.8 miles of NFS road and 5.4 miles of temporary roads; additionally, this alternative would require 0.4 mile of NFS road reconstruction. The proposed 1.7-mile extension of the 6547 road enters the Detailer Creek basin, crosses the creek and ends at the junction of two proposed temporary roads. Future harvest along this road is a possibility, but future extensions of the road may be impractical because of construction difficulties due to the terrain forcing the road into the beach buffer.

The 6540, 51009, 51403, 51421, and 51451 road segments proposed under this alternative are less than 1 mile in length and are either short extensions of existing roads or new roads starting from the existing road system.

The 5.4 miles of temporary roads built under this alternative would be decommissioned after the timber sale. All NFS road constructed under this alternative would be closed at the end of the timber sale. This includes the 0.4 mile of NFS roads that would be reconstructed if this alternative were chosen.

Alternative E

Alternative E proposes the construction of 2.2 miles of NFS road and 2.3 miles of temporary roads; additionally, this alternative would require 2.2 miles of NFS road reconstruction. The proposed 1.7-mile extension of the 6547 road enters the Detailer Creek basin, crosses the creek and ends at the junction of two proposed temporary roads. Future harvest along this road is a possibility but future extensions of the road may be impractical because of construction difficulties due to the terrain forcing the road into the beach buffer.

The 51451 road segment proposed under this alternative is less than 1 mile in length and is a short extension starting near the end of the 6545 road.

The 2.3 miles of temporary roads built under this alternative would be decommissioned after the timber sale. All NFS road constructed under this alternative would be closed at the end of the timber sale. This includes the 2.2 miles of NFS roads that would be reconstructed if this alternative is chosen.

Alternative F

Alternative F proposes the construction of 0.5 mile of NFS road and 4.0 miles of temporary roads; additionally, this alternative would require 2.2 miles of NFS road reconstruction.

The 51451 road segment proposed under this alternative is less than 1 mile in length and is a short extension starting near the end of the 6545 road.

The 4.0 miles of temporary roads built under this alternative would be decommissioned after the timber sale. All NFS road constructed under this alternative would be closed at the end of the timber sale. This includes the 2.2 miles of NFS roads that would be reconstructed if this alternative is chosen.

Cumulative Effects

Wrangell Ranger District Access and Travel Management Plan Environmental Assessment (ATM EA)

The Wrangell Ranger District Access and Travel Management Plan Environmental Assessment (ATM) was completed to comply with the 2005 Travel Management rule (36 CFR 212) and to designate a sustainable system based on estimated projected road maintenance funds.

The ATM EA combines the Zarembo Roads Analysis (2005) and the Wrangell Ranger District Road Analysis (excluding Zarembo Island) published in 2006. The Selected Alternative (modified Alternative 4) uses the average annual road maintenance budget projections as sideboards for what roads could be maintained at what levels. This alternative would close many of the roads in the Navy project area. The roads that would remain open within the project area are 0.76 mile of the 6538, 6540, and 6541; 0.68 mile of the 6545 and 6546; 0.89 mile of the 6547; 0.80 mile of the 51009; 0.53 mile of the 51401; 6.91 miles of the 51540 and 51720; and the 51723. All other roads will eventually change to ML1 (closed) when the implementation process is complete. The Selected Alternative of the ATM is completely compatible with any Navy Timber Sale alternative. The ATM does not stipulate exactly when roads will be closed; this leaves room for use of the roads during the Navy Timber Sale even if the given road is scheduled for eventual closure.

As part of the decision, roads not needed for long-term management will be decommissioned. Roads that are used intermittently will be placed in an ML1 condition.

The following table provides the details contained in the decision for the Navy project area. The information comes directly from the ATM and Decision Notice.

The following table lists the objective maintenance levels (OBML) and access for the National Forest System (NFS) roads. This table is organized by route number and includes roads to be added to the NFS. Roads to be open to off-highway vehicle (OHV) use are indicated in each alternative. The designation for these roads as OHV accessible would be pending an engineering study of the feasibility of these roads for mixed use.

Table 3-33
Navy Project Area – Existing NFS Roads OBML

Route Number	Route Name	Segment	Length (miles)	Priority	ATM EA Decision
					OBML
6538	Kindergarten Bay	A	0.76	Moderate	2
6538	Kindergarten Bay	B	0.46	Low	1
6539	Snow Ridge	A	1.37	Moderate	1
6540	Mussel Shell	A	10.23	Critical	2
6541	Anita Bay Access	A	0.49	Critical	2
6541A		A	0.04	High	2
6542	Mosman Inlet	A	0.78	Low	1
6543	Little Lake	A	1.68	High	1
6544	Ribbon Chert Pit	A	2.25	Critical	1
6544	Ribbon Chert Pit	B	0.45	Low	1
6545	Almost Quiet	A	0.68	Moderate	2
6545	Almost Quiet	B	0.74	Moderate	1
6546	East Mosman Inlet	A	2.07	Moderate	2
6547	Burnett Inlet	A	0.89	Critical	2
6547	Burnett Inlet	B	0.31	Low	0
6548	Tidal Flat	A	0.66	Moderate	1
6558	Mossman Spur	A	0.57	Moderate	1
6560	Lake Spur	A	0.52	Moderate	1
51000	Harbor Creek	A	0.37	Moderate	0
51001	Harbor Creek Spur	A	0.26	Moderate	0
51009	Kindergarten Pass	A	0.80	Moderate	2
51009	Kindergarten Pass	B	0.42	Moderate	1
51011	Cedar Cliff	A	1.20	Critical	1
51011	Cedar Cliff	B	0.12	Low	0
51381	Kindergarten	A	0.28	Low	1
51401	East Sortyard	A	0.53	Moderate	2
51401	East Sortyard	B	0.21	Low	1
51402	West Sortyard	A	0.60	Moderate	1
51421	West Mossman Inlet	A	0.45	Moderate	1
51441	Upgrade	A	1.24	High	1
51540	Fishtrap	A	6.91	Critical	2
51540	Fishtrap	B	1.50	High	1
51541	North Pump	A	0.91	Moderate	1
51543	East Fishtrap	A	0.53	Low (closed)	1
51544	North Fork Creek	A	1.97	Critical	1
51581	Wetbeck	A	1.44	Moderate	1
51720	Anita	A	3.58	High	2
51723	Upper Anita	A	1.85	High	2

Source: Access and Travel Management EA and Decision Notice, 2007

Other Projects

Maintenance and reconditioning of existing NFS roads is an ongoing process that occurs on a periodic basis. Normally, this type of road work is determined to fit the

category of routine repair and maintenance of roads that do not individually or cumulatively have a significant effect on the quality of the human environment and may be categorically excluded (FSH 1909.15, 31.12). The maintenance and reconditioning of NFS roads on the project area may occur before, during, and after the project analysis. This work is done through separate service contracts to reduce the backlog of deferred maintenance, recondition roads to comply with BMPs, maintain the existing infrastructure for the proposed timber sale or future harvest entries, and other National Forest System management activities. The timing of this work may coincide with this project's analysis, but is not part of the project. Any effects from the road maintenance and reconditioning work are included in the cumulative effects analysis for this project.

The change authorized under any of the Navy project alternatives to the Anita Bay road system is not expected to impact long-term access or travel management on the existing Anita Bay road system. During the timber sale, there may be periods where the purchaser maintains specific existing roads. Roads may also be temporarily blocked to move equipment or for safety purposes during logging operations. These temporary conditions will not have a long-term cumulative impact.

Maintenance of existing National Forest System roads will occur in the project area during the life of the project. Road maintenance of some type is generally performed annually on most of the ML2 collector roads in the Anita Bay road system. In 2009, another round of brushing is planned for most of the ML2 roads. Any potential contracts for maintenance and reconditioning would be designed to avoid interference with the proposed timber sale.

The 2008 Etolin Island Road Closure contract implements part of the ATM EA by closing, or preparing to close (stormproofing) about 1.5 miles of NFS roads in the project area. The roads within the Navy project area are the 6560, 51000, and 51011. None of these roads would be used for any of the alternatives in the Navy EIS. There may be similar closure projects after a Navy alternative is selected to get the road system closer to the chosen alternative of the ATM EA. These projects may occur before, during, and after implementation of the Navy ROD. The projects would be carefully designed to avoid interference with the Navy project activities.

Road maintenance and reconditioning projects since 2005 include the brushing along the ML2 and ML3 roads and hand-road maintenance. Hand-road maintenance consists of clearing trees from the roadway, cleaning partially or completely blocked culverts, sign installation, and other miscellaneous road maintenance. Additionally, in 2006, there was a small maintenance contract that cleared a blocked culvert along the 51720 road.

At the Anita Bay North LTF, there is a proposal to widen the lower barge ramp and widen the roadway between the current parking lot (old campsite) and the Anita Bay North LTF. This will enable small operators to use the lower barge ramp for loading logs. The steep slope between the parking lot and LTF will be laid back at a gentler slope, which will reduce the chances of cut-slope erosion. The design for this project is complete, but due to the present funding situation, it is impossible to predict exactly when it will be completed.

The Fishtrap Salvage Timber Sale, sold in 2007, is scheduled for completion by late 2009. The salvage sale utilizes existing roads and provides maintenance in accordance with use. Activities associated with this sale will not affect the Navy timber sale.

Activities associated with the Porcupine Salvage Timber Sale (contract termination date October 2010) may be conducted at the same time as the Navy project. The salvage sale will utilize existing roads and provide maintenance in accordance with use. Coordination may be necessary at the LTF if the two timber sales have concurrent barging operations. This small (766 MBF) salvage sale is not likely to impact the Navy project.

A project proposal for the Wrangell District Roadside Timber Sales was added to the SOPA in January 2009 and scoping has begun. This project is designed for multiple small timber and fuelwood sales and microsales. It would harvest up to 5 MMBF of salvage and green timber along the existing road systems on Wrangell, Zarembo, and Etolin Islands over multiple years. This project would not substantially alter the forested considion for the project area and would only affect those areas adjacent to exisitng roads.

During the Navy Timber Sale, areas where logging activity are or will be taking place will be closed to the types of commercial activities described in the Roadside Timber Sales proposed action.

Watersheds and Fisheries

Introduction

This section describes the existing condition of watershed and fisheries resources in the Navy project area and discloses the direct, indirect, and cumulative effects of the proposed alternatives.

There are two types of watersheds within the Navy project area - true watersheds and frontal watersheds. True watersheds are defined as an area that contributes surface and subsurface water to a single point. Frontal watersheds have multiple streams draining directly into saltwater.

The project area is characterized by north-south trending ridges up to 3,920 feet high separated by glacially carved valleys feeding into bays and inlets. A large low-elevation area is located in the center of the project area where these glacial valleys converge. These landforms determine the arrangement of natural channel types, fish habitat, and sediment risk.

Existing uses of water in and around the Navy project area include:

- growth and propagation of fish,
- use by other aquatic life and wildlife,
- recreation use,
- seasonal water supply at the Forest Service field camp (a small creek at the head of Burnett Inlet),
- hydropower,
- salmon aquaculture,
- ater supply at the Burnett Fish Hatchery (Burnett Creek),
- salmon aquaculture in marine waters near the mouth of Fishtrap Creek in Anita Bay, and
- oyster aquaculture in marine waters south of Cooney Cove.

Analysis Area

This section evaluates the direct and cumulative environmental effects from the proposed alternatives on the true and frontal watersheds shown in Figure 3-16. The effects from the proposed alternatives are confined within the boundaries of those watersheds and do not affect adjacent watersheds. The analysis discloses the effects to stream channels and riparian management areas, water yield, water quality, marine habitat, fish habitat, and fish passage.

The Navy project area on Etolin Island consists of 31 7th field[5] Hydrologic Units (HUCs), referred to as watersheds, totaling 81,575 acres (Figure 3-16). 18 of these watersheds are true watersheds, 13 are frontal watersheds.

In the analysis area, true watersheds provide more fish habitat than frontal watersheds (85 miles of fish streams versus 32), and are more vulnerable to cumulative effects as the larger, fish-bearing streams are downstream of all activities in the watershed. In frontal watersheds, there are many small unconnected streams, most of which only contain fish habitat near the shoreline. Thus, effects of activities in these areas are not concentrated downstream and are not discussed in detail; more information on frontal watersheds can be found in the Watershed/Fisheries Resource Report. Site-specific actions proposed in frontal watersheds are discussed in the unit and road cards.

The Burnett Lake Creek watershed is in the project area, but does not have any harvest or road building proposed. None of the proposed timber sale activities will affect the watershed, the aquaculture operations, hydropower, or water supply present; therefore, it will not be discussed in detail.

There are no impaired watersheds in the Navy project area according to the State of Alaska and no municipal watersheds in the project area.

---

[5] Hydrologic Units Codes (HUCs) are a hierarchical system of numbering watersheds, and the fields correspond to size. Etolin Island is a 5th field HUC containing several 6th field HUCs, which in turn are combinations of 7th field HUCs. Each HUC is delineated along drainage divides.

Figure 3-16
Watershed and Fisheries Analysis Areas

Source: Wrangell Ranger District GIS layers

Data Sources

Field reconnaissance was completed from 2004-2007 to map streams in the project area and survey watersheds to determine their sensitivity to past management activities. Road condition surveys (RCS) were completed on the Anita Bay road system from 1998 to 2004. Other streams were located and classified based on aerial photographs and Laser Detection and Ranging (LIDAR) data from 1997 and 2004.

Approximately 21.6 miles of valley bottom anadromous streams and 56 fish-trapping locations are included in the ADF&G Anadromous Catalog of 2006 in the Navy project area.

Fish habitat extent was updated with electro-shocking of streams within and around unit boundaries. Tier II Stream Surveys were conducted on Duckbill, Navy, Pump, Wetbeck, and Camp Creeks. Region 10's Tier II survey is a methodology that provides consistent, quantitative estimates of habitat parameters necessary to evaluate the condition of a stream relative to basic riparian habitat management objectives. Habitat metrics for the stream segments surveyed showed relatively healthy aquatic habitat in comparison to the natural range of variability. Additional information is included in the Watersheds and Fisheries Resource Report in the project planning record.

Stream Channels and Riparian Management Areas (RMA)

Affected Environment

The Navy project area contains 376 miles of mapped streams, which provide habitat for aquatic organisms and store and transport water and sediment. Streams are differentiated by process group, channel type, and by Aquatic Habitat Management Unit (AHMU) class which is displayed in Table 3-34 along with corresponding ADF&G stream numbers from the Anadromous Stream Catalog.

Process groups describe the geomorphic properties of stream channels and their general location in the landscape, while channel types further differentiate channels within process groups (Paustian 1992). The process group code is explained in Appendix B (Unit Cards) in the Draft EIS.

Streams are further classified based on their ability to produce fish, which is determined by physiological and biological data.

- 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 provide reasonable enhancement opportunities for anadromous fish. There are approximately 45 miles of mapped Class I streams in the project area watersheds.
- Class II. Streams and lakes with resident fish or fish habitat and generally steep (6 to 25 percent or higher) gradients where no anadromous fish occur, and otherwise not meeting Class I criteria. There are approximately 74 miles of mapped Class II streams in the project area watersheds.
- 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.

There are approximately 199 miles of mapped Class III streams in the project area watersheds.

- Class IV. Other intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to directly influence downstream water quality or fish habitat capability. There are approximately 71 miles of mapped Class IV streams in the project area watersheds; the actual length is considerably higher due to the difficulty to map small streams without extensive ground reconnaissance.

The Navy project area contains 550 acres of lakes, which provide habitat for aquatic organisms and store and transport water and sediment. Important project area lakes include Kindergarten Lake, Burnett Lake, and Navy Lake. All three of these lakes are upstream of anadromous fish barriers and provide high-quality resident fish habitat.

Table 3-34
Stream Class for All Watersheds in the Analysis Area

Watershed	ADF&G	Miles of Stream Class			
Name	Number	I	II	III	IV
Anita Creek		0.41	1.88	4.13	0.93
Burnett Lake Creek		0.00	1.66	6.21	0.00
Boss Creek	106-22-10110	0.55	0.00	8.98	0.86
Camp Creek	106-22-10440	0.51	0.65	3.68	0.45
Connelly Creek	106-22-10112	0.84	0.55	3.28	0.00
Cooney Cove Frontal	106-20-10110	0.22	0.00	0.00	0.00
Cooney Creek		0.00	3.12	1.15	1.59
Detailer Creek	106-22-10148	0.44	2.38	7.42	1.74
Duckbill Creek	107-30-10760	4.83	2.82	4.99	1.32
Fishtrap Creek (ADFG Brad Creek)	107-30-10800 107-30-10810	4.45	7.93	18.97	8.84
Granite Creek	106-30-10020	0.80	2.42	1.80	1.56
Kindergarten Lake Creek	106-22-10060	0.21	12.55	9.23	5.34
Log Jam Creek (ADFG Flat Creek)	106-22-10060	5.00	0.71	1.72	0.85
Mirkwood Creek	106-22-10040	1.03	1.74	3.77	4.16
Navy Lake Creek	106-22-10160	1.60	5.32	16.82	4.06
Pump Creek	106-22-10080	8.10	6.01	9.23	5.03
Quiet Creek	106-30-10040	1.60	0.66	2.15	1.90
Thrucut/ Goose Lakes Creek	107-30-10780	0.34	3.96	3.77	0.33
Wetbeck Creek	106-22-10100	0.53	1.36	7.27	2.70
East Mosman Frontal		0.00	0.36	0.00	0.11
Lower Big Bend Frontal		0.64	0.20	2.37	0.05
North Anita Bay Frontal	107-30-10810 107-30-10840	0.06	0.19	4.04	0.00
North Steamer Bay Frontal	106-30-10070	0.80	0.56	14.41	2.14
Northeast Burnett Frontal	106-22-10144	0.55	1.24	2.44	1.17
South Anita Bay Frontal		2.29	1.17	9.53	6.84

Watershed	ADF&G	Miles of Stream Class			
Name	Number	I	II	III	IV
Southeast Burnett Frontal		0.99	1.79	0.76	2.23
Steamer Point Frontal		0.36	2.48	5.15	2.61
Upper Big Bend Frontal		2.26	3.93	16.83	1.68
West Burnett Frontal	106-22-10130 106-22-10118 106-22-10130	1.88	3.35	14.82	8.47
West Mosman Frontal		0.33	1.37	13.16	2.70
Wilderness Edge Frontal		3.70	1.55	1.25	1.08

Source: Wrangell Ranger District GIS layers

Riparian Management Areas

Riparian management areas (RMAs) are areas adjacent to streams and lakes that transition from the aquatic to the vegetative environment. RMAs include the stream channel or lake and adjacent lands that have a direct effect on aquatic habitat. Floodplain habitats are completely contained within the RMA areas. At the watershed scale, RMAs form the complex network of features required to sustain hydrologic, geomorphic and ecological processes that occur where water meets land. Protecting RMAs preserves these processes.

Stream RMAs are delineated according to stream value classification and channel type process groups. Minimum protection standards are defined for harvest activities and road building activities. RMAs are delineated for every stream within or adjacent to proposed harvest units. Lake RMAs are delineated as 100 feet from the lake unless soil conditions require a larger RMA.

A total of 258 acres of riparian area along Class I, II, and III streams has been harvested in the Navy project area (Table 3-35) by previous management.

Table 3-35
Percentage of Existing RMA Harvest in the Navy Project Area

Name	Acres of RMA	Percentage of RMA Harvested
Camp Creek	87	37.5%
Duckbill Creek	312	10.2%
Fishtrap Creek	564	1.9%
Granite Creek	113	9.3%
Kindergarten Lake Creek	430	13.4%
Log Jam Creek	211	9.8%
Pump Creek	601	3.7%
Quiet Creek	82	2.4%
Wetbeck Creek	19	14.2%

Source: Wrangell Ranger District GIS layers

Environmental Effects

All alternatives implement Forest Plan Standards and Guidelines, which do not allow for harvest in RMA areas. Therefore, no adverse effects to stream habitat is expected

from timber harvest. Stream crossings and harvest corridors will limit impacts to RMA where feasible.

All Class I and II streams are protected from harvest activities with a minimum horizontal distance of 100 feet from the bankfull margins. Harvest activities near Class I, II, and III streams require that trees be felled away from the stream, and that trees be yarded across or along stream courses be fully suspended. Additional measures are taken to protect streams based on their process group classification. Logging debris introduced into Class IV streams must be removed.

Windfirm riparian no-harvest buffers, as described in the unit cards (Appendix B in the Draft EIS), are implemented in all alternatives, and are expected to prevent direct effects and minimize indirect and cumulative effects to stream habitat. The Forest Service anticipates incidental windthrow associated with some buffers. Incidental windthrow of riparian buffers on the Tongass average 3.7 percent (USDA Forest Service 2007). Stream reaches with past riparian harvest may experience some impacts associated with loss of large wood, regardless of which alternative is selected. The Navy Timber Sale will not worsen those impacts.

Unit cards show the specific locations of RMAs and provide instructions for specific mitigation measures designed to protect water quality and fish habitat, and measures to assure windfirmness of RMAs.

Water Yield and Stream Habitat

Affected Environment

Water yield may be adversely affected by timber harvest activities. In turn, it may indirectly affect fish habitat.

Changes in annual water yield following timber harvest and road building have been documented in numerous studies in the Pacific Northwest and are commensurate with the proportion of watershed harvested (Bosch and Hewlett 1982, Harr 1986, Jones and Grant 1996, Jones 2000, Moore and Wondzell 2005). Timber harvest changes water yield by altering processes that control the amount and timing of water delivered to streams: rain interception, snow storage, snow melt, soil moisture, evaporation and transpiration. Mid-slope roads can intercept subsurface flow paths, converting subsurface waters to surface waters (McGee 2000). Road ditches combine with and extend the stream network, thereby increasing transport efficiency to streams (Montgomery 1994, Wemple et al. 1996).

Recovery of pre-harvest streamflow conditions is reported to occur at between 10 and 30 years in the Pacific Northwest (Jones 2000). Road effects on water yield may not recover until flow paths are reclaimed during road decommissioning.

Cumulative harvest levels that exceed 20 percent in watersheds may indicate potential effects on water yields (Bosch and Hewlett 1982, Grant 2008). Currently, cumulative harvest levels range from 0 to about 16 percent for true watersheds (Table 3-37). Road density does not exceed 2 mi/sq mi (a threshold suggested for properly functioning watersheds), (NMFS 1996) in any true watersheds.

There is no baseline streamflow data available for the project area. Based on the current levels of cumulative watershed harvest and roads, and field-based assessment of channel conditions, it is unlikely that water yields have been measurably changed by past harvest or roads in any of the Navy project area watersheds.

Increases in peak streamflow could result in changes in channel morphology and habitat features. Higher levels of stream flow during dry periods could be beneficial to aquatic life, while lower levels of stream flow during dry periods could limit fish migration, reduce pool depth, and increase stream temperature. We have concluded above, based on field surveys and observations, that streamflows and channel morphology in the project area have probably not been affected by past management.

Environmental Effects

Direct and Indirect Effects

Alternatives that result in 20 percent of the watershed being harvested over the past 30 years may change water yields. Every alternative except F exceeds this level in at least one true watershed. In most cases, effects will be minimized through partial harvest with high retention and helicopter yarding. Road density will only exceed 2 mi/sq in Alternative C for the Kindergarten Lake watershed; this density will be greatly reduced following ATMP implementation. Alternative C poses the most risk for changes in water yields, but the changes will be minor and not result in indirect effects to water quality or essential fish habitat. Partial retention and landscape location of harvest units were important factors in alternative development that reduce the risks of measurable changes to water yield (Grant 2008).

Table 3-37 shows several watersheds that would have cumulative harvest greater than 20 percent that may have a minor influence on water yield. This table reports all harvest, when in fact a large percentage of the proposed harvest is selective harvest with 70 percent retention that will have much less impact to water yield and slope stability than clearcutting. Measurable changes in water yield from timber harvest are not expected in any alternative.

Roads proposed in the action alternatives will increase road density but the levels shown in Table 3-38 should not have substantial affect on water yield. Only the Kindergarten Lake watershed will exceed 2 mi/mi^2 for Alternative C. Following implementation of the ATMP, road storage will help mitigate any hydrologic effects associated with roads in the project area.

Water Quality

Affected Environment

Water quality, as measured by stream temperature and sediment, may be adversely affected by timber harvest activities. In turn, it may indirectly affect fish habitat.

Timber harvest activities in Southeast Alaska affect stream temperature and sediment. Water quality impacts from timber sale activities may be short-lived or chronic depending on the extent of land disturbance. For instance, sediment may be released into streams from disturbed soil in yarding corridors during storms for 1 to 2 years

while the area revegetates. If not addressed, a larger landslide may release sediment for 5-10 years, while sediment release from an eroding road prism may continue indefinitely. Increased peak flows could result in stream channel erosion.

Stream Temperature

Stream temperature can increase when riparian forests or streamside vegetation is harvested or experiences blowdown. Removal of streamside vegetation shade can increase stream temperature. In coastal British Columbia, daily maximum temperature in summer increased in streams with no buffer, while water temperature in streams with 10 and 30 m buffers did not (Gomi et al 2006). Stream temperatures may also increase when large areas of hillsides are clearcut, increasing soil temperatures higher in the watershed.

No stream temperature data is available for the project area. However, given the relatively small proportion of existing riparian harvest in most watersheds, and the recovery of canopy since riparian forest along fish streams has been harvested (prior to TTRA in 1991), it is unlikely that stream temperatures have been measurably increased by past timber harvest in the Navy project area.

Sediment

Sediment can be introduced into streams by timber harvest, channel erosion, road construction, road erosion, road failures, landslides, debris flows, storms, and rain splash on bare soils. The delivery of sediment to streams from these events depends on their connection to streams, even through road networks (Gomi et al 2005).

TNF monitoring data indicate that harvested areas are consistently within the established standard of less than 15 percent detrimental soil disturbance (USDA Forest Service 2005).

Landslides have been inventoried and are discussed in the Soils section and Soils Resource Report. Areas in the Quiet and Wetbeck Creek Watersheds were deferred based on slope stability. No slopes over 85 percent will be harvested for the Navy Timber Sale.

Road condition survey (RCS) inventory was conducted throughout the project area to identify erosion features that may be a source of sediment. Erosion features include fill and cut-slope erosion, road surface erosion, ditch erosion, and other problems that can shed excess sediment into streams. Table 3-36 displays the number of erosion features by watershed in the project area. A maintenance contract was completed in 2006 that corrected significant erosion features that were contributing sediment to stream courses. Minor erosion features such as exposed soils on cut slopes still exist and will continue to be corrected in future maintenance contracts. As a standard part of the timber sale contract, road maintenance and erosion control will be required for roads used in the Navy Timber Sale.

Table 3-36 also displays current numbers of stream crossings in the project area, an indication of past short-term sediment increases and current sediment entry points from road systems.

Table 3-36
Existing Erosion Features[1] and Stream Crossings by Watershed

Watershed Name	# of Erosion Features	# of Stream Crossings
Anita Creek	5	12
Camp Creek	1	0
Duckbill Creek	4	20
Fishtrap Creek	4	28
Granite Creek	2	2
Kindergarten Lake Creek	10	57
Log Jam Creek	14	14
Pump Creek	5	34
South Anita Bay Frontal	21	42
Steamer Point Frontal	2	0
Thrucut/ Goose Lakes Creek	5	8
Upper Big Bend Frontal	1	1
West Burnett Frontal	2	8
Wetbeck Creek	2	6

[1] Existing as of RCS 2004
Source: Wrangell Ranger District road condition survey database (2004).

Table 3-37
Harvest Proposed in True Watersheds by Alternative

Watershed		Existing Harvest		Acres of Proposed Harvest					Total Proposed % of Watershed Harvested[1]				
Name	**Area (acres)**	**<30 years (acres)**	**%**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
Anita Creek	1,330.5	68.5	5.1%	64.3	258.1	243.9	258.1	91.6	10.0%	24.5%	23.5%	24.5%	12.0%
Camp Creek	1,509.4	132.4	8.8%	36.5	62.5	61.1	15.9	0.2	11.2%	12.9%	12.8%	9.8%	8.8%
Cooney Creek	1,046.0	0	0%	0	129.9	0	0	0	0.0%	12.4%	0.0%	0.0%	0.0%
Detailer Creek	2,082.5	0	0%	189.7	226.6	173.6	129.1	0	9.1%	10.9%	8.3%	6.2%	0%
Duckbill Creek	2,530.4	376.6	14.9%	179.5	228.2	118.0	75.2	106.0	22.0%	23.9%	19.5%	17.9%	19.1%
Fishtrap Creek	7,091.1	276.3	3.9%	574.9	891.8	483.2	319.1	160.9	12.0%	16.5%	10.7%	8.4%	6.2%
Granite Creek	1,106.2	145.0	13.1%	0	18.7	0	18.7	18.7	13.1%	14.8%	13.1%	14.8%	14.8%
Kindergarten Lake Creek	5,072.5	830.2	16.4%	121.5	425.7	222.1	123.1	177.7	18.8%	24.8%	20.7%	18.8%	19.9%
Log Jam Creek	2,271.2	290.7	12.8%	0	89.3	89.3	89.3	89.3	12.8%	16.7%	16.7%	16.7%	16.7%
Mirkwood Creek	945.7	0	0%	67.2	137.3	67.2	0	9.5	7.1%	14.5%	7.1%	0%	1.0%
Pump Creek	5,718.0	443.4	7.8%	150.3	260.6	225.0	201.3	206.8	10.4%	12.3%	11.7%	11.3%	11.4%
Quiet Creek	934.2	22.5	2.4%	115.8	116.2	116.2	33.3	33.3	14.8%	14.9%	14.9%	6.0%	6.0%
Thrucut/ Goose Lakes Creek	1,664.2	39.9	2.4%	14.6	14.6	14.6	14.6	14.6	3.3%	3.3%	3.3%	3.3%	3.3%
Wetbeck Creek	2,267.2	330.0	14.6%	99.3	99.3	49.2	27.2	49.0	18.9%	18.9%	16.7%	15.8%	16.7%
Total				**1,614**	**2,959**	**1,863**	**1,305**	**957**					

[1] Includes all proposed timber harvest units (clearcut and partial harvest) and harvest that has occurred over the past 30 years.
Source: Wrangell Ranger District GIS layers

Table 3-38
Proposed Road in True Watersheds by Alternative

Watershed		Existing	Miles of Proposed Road[1]					Post Sale Road Density				
Name	Area (acres)	Roads (miles)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Anita Creek	1,330.5	2.82	0	0.19	0	0.19	0	1.36	1.45	1.36	1.45	1.36
Camp Creek	1,509.4	0.48	0.77	0.77	0.77	0.77	0	0.53	0.53	0.53	0.53	0.20
Cooney Creek	1,046.0	0	0	2.58	0	0	0	0	1.58	0	0	0
Detailer Creek	2,082.5	0	1.64	2.04	1.42	1.27	0	0.50	0.63	0.44	0.39	0
Duckbill Creek	2,530.4	6.04	0.32	1.12	0.15	0.11	0.32	1.61	1.81	1.57	1.55	1.61
Fishtrap Creek	7,091.1	4.87	0	1.55	0	0	0	0.44	0.58	0.44	0.44	0.44
Granite Creek	1,106.2	0.95	0	0	0	0	0	0.55	0.55	0.55	0.55	0.55
Kindergarten Lake Creek	5,072.5	12.07	1.99	4.27	2.25	0.25	0.76	1.77	2.06	1.81	1.55	1.62
Log Jam Creek	2,271.2	5.10	0	0	0	0	0	1.44	1.44	1.44	1.44	1.44
Mirkwood Creek	945.7	0	0.51	1.21	0.51	0	0.11	0.35	0.82	0.35	0	0.07
Pump Creek	5,718.0	10.68	0.45	0.45	0.45	0.45	0	1.25	1.25	1.25	1.25	1.20
Quiet Creek	934.2	0.10	1.00	1.00	1.00	0.23	0.23	0.75	0.75	0.75	0.23	0.23
Thrucut/ Goose Lakes Creek	1,664.2	2.50	0	0	0	0	0	0.96	0.96	0.96	0.96	0.96
Wetbeck Creek	2,267.2	3.29	0.12	0.12	0.12	0.12	0.12	0.96	0.96	0.96	0.96	0.96
Total			**6.81**	**15.29**	**6.67**	**3.39**	**1.54**					

[1] Includes NFS and temporary roads
Source: Wrangell Ranger District GIS layers

Sediment Risk Assessment

The Sediment Risk Assessment (SRA) (Geier 1998) is a descriptive model developed for the TNF that uses watershed characteristics such as slope, amount of harvest, road density and stream density to estimate the potential risks of mass movement, sediment transport, and storage of stream channels in each watershed.

A sediment risk assessment was conducted for all watersheds in the Navy project area.

This analysis focused attention to watersheds that may have inherently higher risk for sediment transport, and delivery. Results and additional information on the SRA can be found in the Watershed/Fisheries Resource Report.

Environmental Effects

All action alternatives would implement BMPs and Forest Plan Standards and Guidelines. Although the alternatives vary in their relative risks to watershed

resources, none of the alternatives is expected to result in significant direct, indirect, or cumulative effects.

Stream Temperature

Windfirm riparian no-harvest buffers, as described in the unit cards (Appendix B of the Draft EIS), are expected to prevent measurable direct, indirect, or cumulative effects to stream temperature.

Sediment

All alternatives may result in short-term increases in sediment. In particular, road construction and drainage structure installation and removal would temporarily increase sediment delivery to streams. The temporary increase would not degrade water quality or fish habitat. Implementation of BMPs described in the unit and road cards is expected to maintain water quality within standards established under the Clean Water Act, and minimize impacts to essential fish habitat.

According to the Sediment Risk Assessment, Quiet Creek watershed is the most susceptible to sedimentation. This watershed risk was addressed by the IDT by deferring harvest in on the east side of the watershed to protect sensitive streams and slopes within the watershed. Roads have been located to reduce risk of sedimentation and will be closed after timber sale activities are completed. The other watersheds in the project area have a considerably lower sediment risk.

Road construction in Southeast Alaska requires substantial ground disturbance, which may result in at least short-term increases in sediment transport (Paustian 1987). As the amount of road increases, the potential for sediment increases. Table 3-38 compares road construction by alternatives by watershed.

A number of existing roads are slated for closure by the decision for the WRD ATM EA. Closure of several roads identified will have significant beneficial effects to watershed condition.

There are no Class I stream crossings on proposed roads (NFS and temporary) in this project. Table 3-39 displays the number of stream crossings for Class II and Class III streams proposed for all alternatives. Stream crossing locations may change during implementation according to ground factors as indicated in the unit and road cards.

Direct and Cumulative Effects

Based on the information found in Tables 3-37 and 3-38 the risk of increased sedimentation in the project watersheds is low. Practices that will minimize erosion and sediment introduction to streams are described in detail in unit and road cards. These include:

- Windfirm riparian no-harvest buffers
- Helicopter yarding (in some alternatives)
- Road location to avoid unstable terrain or unstable stream crossings
- Use of best management practices during instream work and structure installation and removal.
- Temporary road decommissioning
- Storage of forest system roads after timber sale activities (including removal of live stream culverts, waterbars, and conscientious attention to drainage of inboard ditchlines on steep slopes)

Table 3-39
Class II and III Stream Crossings for Proposed NFS (S) and Temporary (T) Roads

Watershed Name	Alt. B		Alt. C		Alt. D		Alt. E		Alt. F
Stream Class	**II**	**III**	**II**	**III**	**II**	**III**	**II**	**III**	**III**
Camp Creek	0	2S	0	2S	0	2S	0	2S	0
Cooney Creek	0	0	2S	0	0	0	0	0	0
Detailer Creek	2S	4T, 2S	2S	4T, 2S	2S	3T, 2S	2S	2T, 2S	0
Duckbill Creek	0	0	1T	0	0	0	0	0	0
Fishtrap Creek	0	3T	0	0	0	0	0	0	0
Kindergarten Lake Creek	1S	1S	1S	2S	1S	1S	0	0	0
Mirkwood Creek	0	2S	0	5T, 2S	0	2S	0	0	1T
Pump Creek	1T	0	1T	0	1T	0	1T	0	0
Quiet Creek	0	3T	0	3T	0	3T	0	0	0
Steamer Point Frontal	1S	1T, 4S	1S	1T, 4S	0	0	0	0	0
Upper Big Bend Frontal	0	0	0	3S	0	0	0	0	0
Total	**4S, 1T**	**11S, 11T**	**6S, 2T**	**15S, 13T**	**3S, 1T**	**7S, 6T**	**2S, 1T**	**4S, 2T**	**1T**

Source: Wrangell Ranger District GIS layers

Marine Habitat

Affected Environment

The accumulation of bark and other woody debris on the ocean floor associated with the transfer and storage of logs can affect marine habitats by smothering organisms or creating unfavorable chemical conditions. Tideland fills at marine access facilities can destroy marine habitats and displace organisms.

There are currently two existing LTFs in the Navy project area. They are both located in Starfish Cove on the south side of Anita Bay. Anita Bay North is used primarily for equipment loading but has had 6.6 MMBF moved across it associated with small timber sales. These facilities are subject to State and Federal permits which specify bark deposition thresholds of less than 1 acre of continuous coverage 10 cm thick.

Bark deposition surveys for Anita Bay North were conducted in 2000 and found bark deposits covered 0.5 acre of marine habitat in front of the LTF facility. The existing levels are less then the permit threshold and are not expected to have any adverse affects on marine life.

The South Anita Bay facility has had 102.85 MMBF moved across associated with larger timber sales including the Granite Timber sale that built the LTF in the early

1980s. Dive surveys in 2000 indicate that an area of 0.8 acre of marine habitat have continuous bark coverage; no timber has moved across LTF from 2000 to the present. This measure is below the 1-acre permitted threshold and is not expected to have any adverse affects on marine life.

There is one new LTF location proposed for the Navy Timber Sale. Alternative C proposes the construction of the Mosman Inlet LTF at Cooney Cove. A marine dive survey was completed in April 2007. The survey found that marine life, benthic diversity, vegetation and bathymetric properties appear to be stable and of common abundance. The dive surveys results concluded that the Cooney Cove LTF site meets the Forest Plan and Coastal Zone Management Criteria for LTF development.

Environmental Effects

Most of the proposed timber harvest on the road system will go through the South Anita Bay facility. Alternatives B and C would have the most impact on the marine habitat, due to larger quantities of log transfer, as well as the construction of the Mosman Inlet LTF. The timber sale operator will direct barge transfer for this timber sale or have to apply for additional permits to water logs. Direct and indirect impacts include bark deposition and potential for pollution associated with transfer of fuel or other hazardous materials at the facility. Bark deposition is not expected to exceed permitted thresholds at any of the LTFs. Fuel transport and storage procedures are governed by contract specifications and subject to spill contingency and reporting requirements.

None of the alternatives is expected to affect marine-based aquaculture in Anita Bay, Burnett Inlet, or near Cooney Cove.

Fish Habitat

Affected Environment

Timber harvest activities may affect fish habitat by altering riparian vegetation and stream channels, or impeding fish migration at road-stream crossings.

Fish habitat in the Navy project area supports populations of pink salmon (*Oncorhynchus gorbuscha*), chum salmon (*Oncorhynchus keta*), coho salmon (*Oncorhynchus kisutch*), and steelhead *(Oncorhynchus mykiss)*. Additional fish populations include resident and anadromous forms of cutthroat trout (*Oncorhynchus clarkii*) and Dolly Varden *(Salvelinus malma Walbaum)*.

Sustaining the production of salmon and trout is partially dependent upon habitat protection, and is a prominent objective of the Forest Plan Standards and Guidelines and the Tongass Timber Reform Act (TTRA) provisions that are applied to timber harvest activities and road construction in the TNF.

Detailed stream habitat surveys were completed in 2005 and 2006 (located in the planning record) for Duckbill, Navy, Pump, Wetbeck, and Camp Creeks. The surveys did not indicate that these stream segments were significantly impaired by sediment increases or RMA harvest. Stream habitat data signified relatively healthy aquatic

habitat for Duckbill, one of the most developed watersheds in comparison to the natural range of variability across the Tongass NF (Thompson 2006). Specific attributes that may be affected by past harvest are discussed in the individual watershed descriptions.

Environmental Effects

Direct and Indirect Effects

Direct effects on fish stream habitat would be associated with drainage structure installation or removal. Instream work would result in short-term sediment increases as described above. BMPs would minimize sediment increases. Windfirm riparian no-harvest buffers, as described in the unit cards and implemented in all alternatives, are expected to prevent direct effects and minimize indirect and cumulative effects to stream habitat.

Fish Passage

Affected Environment

Fish migration impediments on Etolin Island exist on some anadromous and resident fish streams. Impediments to fish migration are usually because of outfall barriers, excessive water velocity, insufficient water depth in culverts, disorienting turbulent flow patterns, lack of resting pools below culverts, or a combination of these conditions (Furniss et al 1991). In the Navy project area, ten culverts do not meet the current fish passage standard ("red culverts") at road/stream intersections (Table 3-40). Red culverts are crossings that do not to allow juvenile fish passage for the full range of design flows at which fish move within. Red culverts often provide passage for fish at some flows just not all desired flows. There are fish populations above all of the red culverts in the Navy project area.

Table 3-40
Red Culverts by Watershed

Watershed Name	# of Red Culverts	Feet of Fish Habitat Affected
Kindergarten Lake Creek	1	209' Class II
Pump Creek	4	2,521' Class I 587' Class II
South Anita Bay Frontal	2	1,923' Class II
Duckbill Creek	1	727' Class II
Upper Big Bend Frontal	1	1,345' Class II
West Burnett Frontal	1	626' Class II
Total	**10**	**2,521' Class I** **5,417' Class II**

Source: Wrangell Ranger District road-condition-survey data

Environmental Effects

Efforts are being made to prioritize and fix fish passage problems across the Tongass. The Forest Service does not anticipate any direct or indirect effects on fish passage. Drainage structures that would be installed for Navy Timber Sale roads would meet fish passage standards. Site information is provided in road cards. The 6544 road would be closed under implementation of the ATMP, which will remove one red pipe, restoring 1,345 feet of Class II habitat in the upper Big Bend Frontal watershed.

Effects by Alternative

Alternative A

Since no activities are proposed in this alternative, no direct or indirect effects would occur.

Alternative B (Proposed Action)

Alternative B has the second-highest amount of road proposed and the third-highest amount of harvest proposed. One of the biggest differences between Alternatives B and D is the extension of the 51009 road that could produce increased sedimentation in the Steamer Point frontal watershed.

Alternative C

Alternative C was developed to maximize harvest within the constraints of economics and Forest Plan guidelines. Alternative C proposes the highest amount of harvest and road building. It is the only alternative to propose harvest in the Cooney Cove area, which would require the construction of a new LTF to facilitate logging in the area.

Alternative C is also the only alternative to propose roads in upper Fishtrap, lower Mirkwood, and upper Duckbill Creeks, which could affect these anadromous fish streams.

This alternative also proposes additional road in the Steamer Point and Upper Big Bend frontal watersheds including the longest extension of the 51009 road that could affect water quality. There are a few other small road extensions that are exclusive to this alternative.

This alternative has the highest risk of sedimentation, increased water yield, and potential to affect watershed resources.

Alternative D

Alternative D was developed to provide a more-economic alternative that would address specific watershed concerns as well as other resource concerns. This alternative would have cable and helicopter settings, but all of the helicopter settings would be transported to the existing or proposed road system. This alternative has the second-highest harvest acres and third-highest road miles.

Alternative E

Alternative E was developed primarily to address wildlife issues but also addresses issues related to other resources. Helicopter harvest is maximized in this alternative to limit road construction. This alternative limits harvest and road building in the pinch point between Anita Bay and Burnett Inlet. The limited road building reduces the impacts on watershed resources.

Alternative F

Alternative F was developed to stay out of the inventoried roadless area. Because it does not enter the roadless area, it has the lowest amount of road construction and harvest acres.

Cumulative Watershed Effects

Cumulative watershed numbers from past practices for the last 30 years are shown in Tables 3-37 and 3-38. Discussion on water yield and quality are included the existing harvest. Effects of harvest on water quality and yield that occurred greater than 30 years ago are expected to be minimal based on research studies (Grant 2008). Historic harvest in the project area greater than 30 years ago is relatively low. Negligible effects from incidental blowdown are expected to the RMA buffers and stream temperature with the implementation of TTRA and the Forest Plan Standards and Guidelines on the proposed and future projects.

Effects of present and foreseeable future projects will be low since all projects will use existing roads. A project proposal for the Wrangell District Roadside Timber Sales was added to the SOPA in January 2009 and scoping has begun. This project is designed for multiple small timber and fuelwood sales and microsales. It would harvest up to 5 MMBF of salvage and green timber along the existing road systems on Wrangell, Zarembo, and Etolin Islands over multiple years. No timber harvest will occur in the TTRA or riparain management areas and all Forest Plan Standards and Guidleines will be followed.

No substantial cumulative effects on fisheries are expected. Implementation of Forest Plan Standards and Guides, BMPs, and site-specific mitigation discussed on the unit cards will minimize negative cumulative effects. Effects, discussed above, on water yield and quality are expected to be negligible, which will not contribute to negative effects. Only unforeseen events such as landslide, debris blockages of culverts, and road failures could have significant effects on fisheries.

Essential Fish Habitat

The Magnuson-Sevens Fisheries Conservation and Management Act of 1996 requires Federal agencies to consult with the National Marine Fisheries Service (NMFS) on activities that may affect Essential Fish Habitat, defined as “those waters and

substrates necessary to fish for spawning, breeding, feeding or growth to maturity". The Act promotes the protection of these habitats through review, assessment, and mitigation of activities that may adversely affect these habitats.

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act requires all Federal agencies to consult the National Marine Fisheries Service (NMFS) for actions or proposed actions that may adversely affect Essential Fish Habitat (EFH). In accordance with the June 26, 2007 agreement between the Forest Service, Alaska Region and the NMFS, consultation started when NMFS received a copy the draft environmental impact statement (Draft EIS) that contained the EFH assessment.

Findings and Proposed Mitigation

In the EFH assessment, the Forest Service determined that the Navy Timber Sale may adversely affect EFH because Class I streams are directly affected by harvest and stream crossings. Impacts to these waters are expected to be minimal for the following reasons (site-specific details are shown on unit and road cards):

- The majority of the proposed roads will be closed following timber sale activities.
- All Class I and II streams in the Navy project area would be protected by a minimum 100' no-harvest RMA buffer with more area protected for different process groups, sensitive riparian soils, elevated windthrow concern, and other relevant resource concerns.
- Class III streams will be protected at least by a no-harvest buffer to the top of the side slope (v-notch) according to the Forest Plan.
- Maintenance will be built into road construction contracts that will correct existing erosion features.
- Site-specific data was collected on all fish streams in the project area to ensure proper windfirmness buffers, proper channel classification, and size of riparian management areas.
- BMPs would be implemented to protect water quality and aquatic habitats for all freshwater streams in the project area.
- Windfirmness has been incorporated into buffer design to protect all stream and lake buffers.
- Proposed activities in the Navy watershed were deferred for the Navy Timber Sale.
- No new Class I stream crossings would be constructed.

NMFS has identified the saltwater habitat near Etolin Island as EFH for the following species:

arrowtooth flounder	atka mackerel	capelin	chinook salmon
pink salmon	sockeye salmon	chum salmon	coho salmon
eulachon	Greenland turbot	octopus	pacific cod
pacific ocean perch	rex sole	rock sole	flathead sole
dover sole	yellowfin sole	sablefish,	sand lance
sculpin	shark,	shortraker and rougheye rockfish	yelloweye rockfish
skate	squid,	walleye pollock	weathervane scallop

The Navy Timber Sale may adversely affect marine EFH in the project area. Impacts to these waters are expected to be minimal for the following reasons:

- LTF footprint will be minimized to reduce sediment production and land disturbance.
- LTF locations are located in areas where bark and fine sediments will be dispersed by strong tidal currents.
- Habitat surveys have been completed to determine marine habitat and potential impact areas. Location of a new LTF considered siting guidelines as described in the Forest Plan (Appendix G). Site-specific information is displayed in Appendix C of this Final EIS.
- Cumulative bark deposition is expected to remain within permit thresholds.
- There are no effects expected to marine-based aquaculture in Anita Bay or near Cooney Cove.

The Forest Service believes that these design measures will minimize the effects of the proposed activities on EFH.

A copy of the Draft EIS was given to NMFS where they commented on Freshwater and Marine EFH. Changes made between Draft and Final have addressed some concerns raised where feasible. Some of those changes include the deferral of harvest and road building in the Navy watershed and restricting slopes over 85 percent from harvest. A response to all of their comments was returned within 30 days of the comment period as required in the consultation process. The Forest Service will continue the consultation process with the National Marine Fisheries Service.

Monitoring

Monitoring in the Navy project area will occur in conjunction with ongoing Forest-wide monitoring (BMP Implementation). Resident fish MIS monitoring will be conducted in Upper Mirkwood Creek. Coho MIS monitoring may be conducted in the project area.

Wetlands

Introduction

Wetlands are defined as: "those areas that are inundated or saturated by surface or groundwater with a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (40 CFR 230.41 (a) (1)). Identification of wetlands is based on the Corps of Engineers three-parameter system described in U.S. Army Corps of Engineers Wetlands Delineation Manual (US Army Corps of Engineers 1987).

Wetlands 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 forest land base.

The Forest Service is directed to avoid alteration of, and new construction on, wetlands wherever there is a practical, environmentally preferred alternative. On the Tongass, however, it is usually impossible to avoid all wetlands in large timber development projects that involve road construction; this is due to the large proportion of wetlands in the landscape. Where avoidance of wetlands is not practical, the Forest Service needs to demonstrate that the amount of new construction has been minimized. The Forest Service also needs to apply appropriate mitigation measures to minimize the magnitude of impacts and/or maintain wetland function. The strategy, therefore, is to avoid those wetland types that are scarce in the immediate landscape, and/or those wetlands recognized as having a “high value” to the ecosystem, such as estuaries, floating bogs, raised dome bogs, and sedge fens associated with streams and lakes.

All roads constructed for this project will be constructed and maintained in accordance with BMPs for Forest Road Construction (33 CFR 323.4(a)(6)), and as such will be considered exempt from regulation under Section 404 of the Clean Water Act. Construction of the Mosman log transfer facility (LTF) is not exempt. There are no proposed trails, sort yards, buildings, or other construction that would occur on wetlands.

Analysis Area

Direct and indirect effects are expected to be confined in the immediate area of the disturbance, therefore the analysis area for direct and indirect effects is the immediate area of the proposed harvest unit and road. The cumulative analysis considers this project in context with past and foreseeable future projects. The analysis area for cumulative effects is the project area. This area was selected as a means to display the spatial extent of past, present and foreseeable actions near the proposed timber harvest and road construction.

Summary of Effects

Effects on wetlands are measured in terms of miles of road construction on wetlands and acres of road "converted to upland". Timber harvest is measured in terms of acres of harvest on wetlands. Timber harvest would convert the old-growth vegetation to a second-growth stand.

All action alternatives would result in timber harvest and road construction on wetlands. Road locations avoid wetlands to the practicable extent feasible and compliant with Forest Plan direction. Roads are located in wetlands to meet safety and engineering design constraints, and in areas where there was no other option. Road construction would result in loss of wetland habitat in all of the action alternatives. Road construction will follow the 15 baseline provisions provided in 33CFR 323. Alternative C is the only alternative that affects a tall sedge fen wetland. The 6555 road crosses a portion of a tall sedge fen to gain access to a crucial stream crossing location.

Timber harvest would alter forested wetlands in the project area. Additional moisture would reach and be stored in the wetland because of timber harvest removal. This moisture gain would occur until the revegetated stand offsets gains with canopy interception and evapotranspiration. The long-term integrity of the forested wetland would be maintained.

Affected Environment

Wetlands occupy 30 percent of the land area (approximately 31,062 wetland acres) in the Navy project area. There are six wetland types in the project area. They are: Alpine/Subalpine Muskeg, Tall Sedge Fens, Forested Wetlands, Muskeg, Muskeg/Forested Wetland Mosaic, and Estuaries. The Wetland Resource Report contains a narrative description and a wetlands map. Many of the wetlands in the project area are in a pristine condition, though 26 miles of road have been constructed in the lowland Muskeg/Forested complex wetlands. Approximately 424 acres of forested wetlands have been harvested in the past.

Wetland Types

Wetland types that are relatively scarce within the larger landscape may be considered more biologically significant. In the project area, tall sedge fens and estuaries are the least abundant wetland types (Table 3-41).

Table 3-41
Wetland Types in the Project Area on Etolin Island

Wetland Type	Approximate Acres in the Project Area	Percent of the Project Area
Alpine/Subalpine Muskeg	9,424	12
Forested Wetlands	8,260	10
Tall Sedge Fens	99	<1
Muskeg	670	<1
Muskeg/Forested Wetland Mosaic	12,609	16
Total Wetlands	**31,062**	

Source: J:fsfiles\office\gis\navy\covers\Etolin83.gdb:soils and C:\WorkSpace\wetype.dbf

Environmental Effects

Section 404 (f) (1) (A) and (E) of the Federal Clean Water Act exempts silvicultural, timber harvesting, and related road construction activities from permit requirements for the discharge of dredge and fill materials in wetlands. To maintain the exemption, Federal agencies must follow State-approved best management practices. Executive Order 11990, as amended (42 USC 4321 et seq.), however, requires Federal agencies having statutory authority and leadership over Federal lands to avoid, to the extent possible, the short- and long-term adverse impacts associated with the destruction or modification of wetlands. Where feasible, new road construction in wetlands must be avoided. Federal agencies are also required to preserve or enhance the beneficial values of wetlands in their land management actions.

Road Construction and Timber Harvest on Wetlands

The effects to an individual wetland would depend on the amount and type of disturbance, wetland location, distribution in the watershed, the distance to other wetlands and water-bodies, and connectivity of hydrology and habitat between them. Timber harvest, road construction, and off-road OHV use associated with the new road construction have the potential to affect wetlands adversely.

Off-highway vehicle (OHV) travel across wetlands is uncommon on Etolin Island; however, OHV tracks were observed near the 51401 road. Driving OHVs on wetlands can have long-term effects on wetland vegetation. Once the surface organic mantle and root layer are destroyed, the soil structure breaks down readily and readily turns into muck. The changed habitat condition inhibits vegetation reestablishment. The 2005 Travel Management Rule prohibits motor vehicle use off designated roads unless specifically allowed.

Road Construction on Wetlands

The predominant effect of timber harvest activities on wetlands is from excavating or filling for features such as roads, landings, and log transfer facilities. Road construction on wetland sites (Table 3-42) converts the wetland to upland; wetland functions within the road corridor are permanently lost. There have been limited

studies done on the effects of forest roads constructed in the past on wetlands in the Tongass; the studies (Glaser 1998, Kahklen and Moll 1999, McGee 2000) suggest that the hydrologic effects of forest roads are limited to within a few meters of the road. For this project, a road width of 50 feet is used to calculate the affected area. Roads across sloping wetlands may affect hydrologic connectivity across the wetland due to road ditches or road fills. In the project area, 158 acres of wetland have been converted to non-wetland by roads associated with past management activities. Roads are primarily constructed using shot rock overlay, which allows water to seep away.

When it is necessary to cross wetlands, appropriate BMPs and mitigation measures are incorporated into road designs. By minimizing the amount of side-ditching, effects upon groundwater flow and alteration of soil moisture levels are minimized.

Timber Harvest on Wetlands

Many forested wetlands and forested wetland mosaic in the project area support commercial stands of timber. Some of these stands have been harvested in the past and some are proposed for harvest in the Navy Timber Sale. Field observations by the district silviculturist have found that these harvested forested wetlands have all regenerated. Harvest on wetland sites (Table 3-42) can directly affect wetland sites and indirectly affect adjacent or nearby wetlands by:

- altering hydrology which affects soil productivity and stand regeneration,
- changing nutrient pathways,
- generating and delivering sediment,
- changing plant species composition and growth, and
- reducing shading.

Harvest on forested wetlands temporarily affects wetland hydrology, biogeochemical wetland functions and may cause an increase in water yield (Patric 1966). Removal of the canopy increases soil wetness due to more water reaching the soil surface and decreased evapotranspiration. The increase in soil moisture levels following clearcutting may result in slower growth of the regenerating stand. Julin and D'Amore (2003) found that organic soil forested wetlands on the Tongass National Forest successfully regenerate and grow after clearcutting at the minimum rate necessary to be considered commercial forest lands. Soil moisture conditions are expected to remain elevated until evapotranspiration surfaces in the canopy of the young stand become equivalent to pre-harvest conditions. Depending on the soil moisture status of the wetland, this effect can range from negligible or last more than 20 years, but in all cases the effect is expected to be temporary. In partially harvested stands, retention of a portion of the canopy cover would further minimize the effect of timber harvest on soil moisture.

Direct and Indirect Effects by Alternative

Road Construction on Wetlands

All action alternatives would result in road construction in wetlands. Road locations avoid wetlands to the practicable extent feasible. Roads are located in wetlands to meet safety and engineering design constraints, and in areas where there was no other option. Construction will follow the 15 baseline provisions provided in 33CFR 323. Most of the proposed road construction is on Muskeg/Forested Wetland Mosaic (Table 3-42). Only Alternative C would construct a road across the sedge fen adjacent to Cooney Creek. Alternative C would also construct an LTF, affecting approximately 1 acre of the intertidal estuarine wetlands in Cooney Cove.

Alternative C would result in the most (55 acres) wetland converted to non-wetland due to road construction. Alternative B and D are intermediate, affecting 18 and 16 acres, respectively. Alternative F would result in the fewest acres affected (7 acres), followed by Alternative E.

Table 3-42
Effects of Road Construction on Wetlands by Alternative

Wetland Type	Acres in the Project Area	Miles of Existing Road	Acres Affected by Existing Road	Proposed Miles of Roads [1]					
				Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Forested Wetlands	8,260	9.50	58	0	0.9	2.6	1.0	0.4	0.2
Muskeg	670	0.16	1	0	0.1	0.2	0.1	0.1	0.1
Muskeg/Forested Wetland Mosaic	12,609	16.20	98	0	1.8	5.9	1.6	1.1	0.5
Sedge Fen	99	0.14	1	0	0.0	0.4	0	0	0
Total (miles) (acres)		**26.0**	**158**	**0**	**2.8 17 ac**	**9.1 55 ac**	**2.7 16 ac**	**1.6 10 ac**	**0.8 5 ac**

[1] Acres affected are displayed for total only. Calculation of roaded acres based on 50-foot wide disturbed soil road corridor
Source: GIS: Soil/Roads J:fsfiles\office\gis\navy\covers\Etolin83.gdb:soils and C:\WorkSpace\wetype.dbf J:fsfiles\office\gis\navy\alts\alternatives83.gdb:allrds_tlmp_rev

Timber Harvest on Wetlands

All action alternatives propose timber harvest on forested wetlands. The effect of timber harvest is expected to be temporary. All harvested sites are expected to regenerate naturally and produce timber as modeled in the Forest Plan. Wetland hydrology is expected eventually to return to pre-harvest conditions.

Alternative C proposes more harvest on wetlands than the other alternatives (971 acres), however, on a percentage basis, it is similar to the other alternatives. Alternative B proposes the second most harvest, followed by Alternatives D, E and F. Although Alternative F proposes the fewest acres of harvest proposed on wetlands, it would harvest a higher percentage of wetlands (17 percent). Alternative E has the lowest proportionate harvest on wetlands with only 11 percent of the harvest acres being on wetlands. Alternatives B, C, and D are intermediate, with approximately 15 percent of the harvested acres being on wetlands.

Table 3-43
Effects of Timber Harvest on Wetlands by Alternative

Wetland Type	Acres in the Project Area	Acres Harvested in the Past	Proposed Harvest Acres					
			Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Forested Wetlands	8,260	317	0	360	698	254	308	174
Muskeg/Forested Wetland Mosaic	12,609	107	0	135	273	118	84	45
Total	**20,869**	**424**	**0**	**495**	**971**	**372**	**392**	**219**

Source: GIS: Soil/ManagedStands/ProposedUnits:
J:fsfiles\office\gis\navy\alts\alternatives83.gdb:altpolys_tlmp_rev
J:fsfiles\office\gis\navy\covers\Etolin83.gdb:soils and C:\WorkSpace\wetype.dbf

Cumulative Effects

Current use in the area includes recreational hunting and trapping, subsistence gathering, and guided backpacking trips; these activities do not involve new road construction or timber harvest. However, they may result in off-road OHV use on the wetlands. Cumulative acres of wetlands affected by timber harvest and road construction are displayed in the Tables 3-45 and 3-46.

Table 3-44
Cumulative Acres and Percent of Wetland Affected by Timber Harvest

Wetland Type	Project Area Total (acres)	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Forested Wetlands	8,260	317 (4%)	677 (8%)	1,015 (12%)	571 (7%)	625 (8%)	491 (6%)
Muskeg/Forested Wetland Mosaic	12,609	107 (>0.8%)	242 (2%)	380 (3%)	225 (2%)	191 (2%)	152 (1%)
Total (acres) (percent)	**20,869**	**424 (2%)**	**919 (4%)**	**1,395 (7%)**	**798 (4%)**	**816 (4%)**	**643 (3%)**

Source: J:fsfiles\office\gis\navy\alts\alternatives83.gdb:altpolys_tlmp_rev
J:fsfiles\office\gis\navy\covers\Etolin83.gdb:soils and C:\WorkSpace\wetype.dbf

Table 3-45
Cumulative Acres of Road Construction on Wetlands by Alternative

Wetland Type	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Forested Wetlands	58	63	74	64	60	59
Muskeg	1	2	2	2	2	2
Muskeg/Forested Wetland Mosaic	98	109	134	108	105	101
Sedge Fen	1	1	3	1	1	1
Total	**158**	**175**	**213**	**174**	**168**	**163**

Source: J:fsfiles\office\gis\navy\alts\alternatives83.gdb:allrds_tlmp_rev
J:fsfiles\office\gis\navy\covers\Etolin83.gdb:soils and C:\WorkSpace\wetype.dbf

Other projects occurring or likely to occur in the project area include two small timber sales (the Porcupine and Fishtrap salvage sales) and numerous road closure or decommissioning projects. There will be no road construction for the salvage sales, and little to no harvest of standing timber in wetlands. Road closure or decommissioning projects will be restoring natural drainage patterns across roads and may result in a beneficial effect to wetlands. There are no plans to remove road prisms to restore wetland conditions on decommissioned roads.

A project proposal for the Wrangell District Roadside Timber Sales was added to the SOPA in January 2009 and scoping has begun. This project is designed for multiple small timber and fuelwood sales and microsales. It would harvest up to 5 MMBF of salvage and green timber along the existing road systems on Wrangell, Zarembo, and Etolin Islands over multiple years. This project would affect those areas adjacent to the roadside; the effects to wetlands have not been analyzed at this time.

The potential for cumulative effects to wetlands due to harvest and road construction would be highest for Alternative C, followed by Alternative B. Alternative D and E are intermediate, with Alternative F having the lowest impact. All of the alternatives result in a cumulative impact of less than 1 percent of the wetland type. Impacts associated with other uses of the area would depend on how access is managed in the future. Alternative C, which builds the most roads, would pose the greatest potential for disturbance from other users such as off-road OHV use. Alternative F would pose the least potential for indirect impacts associated with road construction.

Wildlife

Introduction

Management Indicator Species

Management Indicator Species (MIS) are those wildlife species whose responses to land management activities are thought to reflect the likely responses of other species with similar habitat requirements. Under the MIS concept, the responses to management activities of a relatively few species are studied and monitored in an effort to determine the impacts to entire groups of species and associated habitats. MIS are used to assess population viability and biological diversity, and for management of game species at the Forest level. MIS are also used to help establish management goals for other species in public demand. The following have been selected as MIS for the Navy project:

Table 3-46
Management Indicator Species Selected for Analysis

Species	Basis for Selection
Sitka black-tailed deer	Important subsistence and game species; range of forested habitats but particular dependence on low-elevation old growth for winter habitat
Alexander Archipelago wolf	Furbearer and game species; wide array of habitat, but particularly sensitive to prey availability and road density
American marten	Represents low-elevation, high-volume old-growth forest
Bald eagle	Represents beach and estuary fringe habitats

Source: 2008 Forest Plan Amendment Final EIS, pp 3-230 through 3-241.

These species were selected because they were deemed the most likely to be impacted by timber harvest activities in the project area. Interagency panels constructed habitat suitability models for deer and marten during the development of the current Forest Plan. Deer model results are also used to assess habitat quality for wolves, because deer are such an important prey species.

The following species are identified as Tongass National Forest (Tongass) MIS, but were not selected as Navy project MIS. The rationale is summarized below.

Table 3-47
Management Indicator Species Not Selected for Analysis

Species	Basis for Non-selection
Brown bear and black bear	Critical habitat components such as salmon streams and beach fringe are already protected by Forest Plan Standards and Guidelines.
River otter, Vancouver Canada goose	Primary habitat protected by Forest Plan Standards and Guidelines. No harvest is scheduled in these habitats
Hairy woodpecker, brown creeper, red-breasted sapsucker, red squirrel	Habitat protected under Forest Plan OGRs, Standards and Guidelines for legacy and cavity-nesters, and other non-harvest areas
Mountain goat	Does not occur in the project area

Source: 2008 Forest Plan Amendment Final EIS, pp 3-230 through 3-241.

Both brown and black bears are habitat generalists, and rely on different resources at different times of the year. Estuary, riparian, and forested coastal habitats receive the highest use by bears. River otters prefer habitat, especially old-growth forest, immediately adjacent to coastal and fresh water environments (Forest Plan Final EIS, USDA 2008 page 3-233). Vancouver Canada geese use wetlands in estuary, river, and upland areas of the Forest (Forest Plan Amendment Final EIS, USDA 2008, page 3-241). The majority of these habitats are protected by Forest Plan Beach and Estuary Fringe Standards and Guidelines (USDA 2008, Forest Plan, pages 4-4& 4-5), Riparian Standards and Guidelines (USDA 2008 Forest Plan, pages 4-50 thru 4-54), and Waterfowl Standards and Guidelines (USDA 2008 Forest Plan, pages 4-93 & 4-94), and is not proposed for harvest under the Navy project.

Hairy woodpeckers, brown creepers, red-breasted sapsuckers, and red squirrels are protected through old-growth reserves, old growth in other non-harvest LUDs, buffers, and Cavity Nester Standards and Guidelines (USDA 2008 Forest Plan, pages 4-91).

Analysis Areas

Game management units (GMUs) are geographical areas defined by the ADF&G to manage wildlife populations. Etolin Island is within GMU 3. Wildlife analysis areas (WAAs) are further subdivisions of GMUs and are used by ADF&G for data collection purposes. VCUs are NFS land divisions that usually approximate large watersheds. The Navy project area is in WAA 1901 and consists of VCUs 4640, 4650, 4660, 4670, and 4680 (Figure 3-17). VCUs 4620, 4630, and 4690 are also included within WAA 1901, which was used for much of the wildlife analyses. The Navy project is in the Etolin Island and Vicinity biogeographic province, which includes Zarembo, Wrangell and Woronkofski Islands.

Deer and wolves are generally analyzed at the WAA level to correspond with harvest data available from the State, and because of the large home range size of wolves.

Analysis of factors influencing wolf populations is considered at two scales for this project. WAA 1901 encompasses all of the roaded area on Etolin Island, all of the proposed timber harvest, and most of the past timber harvest. This WAA was analyzed separately to describe potential impacts in the area where the most past and future habitat modification will occur. However, due to the large range of wolves, it was recommended that factors affecting wolves be analyzed at the scale of multiple

WAAs (2008 Forest Plan page 4-95), therefore cumulative effects have also been analyzed at the scale of WAAs 1901 and 1910 combined, which encompasses all of Etolin Island, including the South Etolin Wilderness.

WAA 1901 was used for the analysis of impacts on marten since this is the smallest area ADF&G uses for reporting harvest statistics.

The effects area selected for bald eagle includes the beach and estuary fringe along the edges of WAA 1901. This area includes all known nest sites.

Summary of Effects

Wildlife species depend on a variety of forest structure to meet their habitat needs. Although each action alternative proposes harvest of forested wildlife habitat, Forest Plan Standards and Guidelines protect some key habitats under all alternatives. These include riparian habitats, beach and estuary fringe habitats, nest buffers, wolf dens, and areas not suitable for timber harvest. Old-growth reserves and other non-harvest areas contribute to the protection of large blocks of old growth and connecting corridors important to many wildlife species.

Sitka Black-tailed Deer

Among the action alternatives, Alternative C would have the greatest negative impact on deer in WAA 1901, with a 2.5 percent short-term reduction in carrying capacity. It is doubtful that any of these reductions in carrying capacity and top quartile habitat will have a significant impact on actual deer numbers since deer do not appear to be limited by habitat at this time, as there is no evidence of over-browsing on most areas of the island. Combined with previous timber harvest, implementation of the current project would result in a cumulative reduction in historical deer habitat capability in the WAA of between 7 and 13 percent, depending on alternative (Table 3-48). Negative effects would be expected mainly after a severe winter with all alternatives, including the No-action alternative.

Alexander Archipelago Wolf

The impacts of proposed timber harvest on deer habitat capability in WAA 1901 (both short term and long term), and therefore wolves, would be greatest under Alternative C, and least under Alternative F, with the other alternatives intermediate in effects. The increase in miles of total roads (which could lead to increased wolf harvest) is greatest under Alternative C and least under Alternative F. Over the long term, the miles of open roads would decrease with all alternatives, mostly due to implementation of the ATMP.

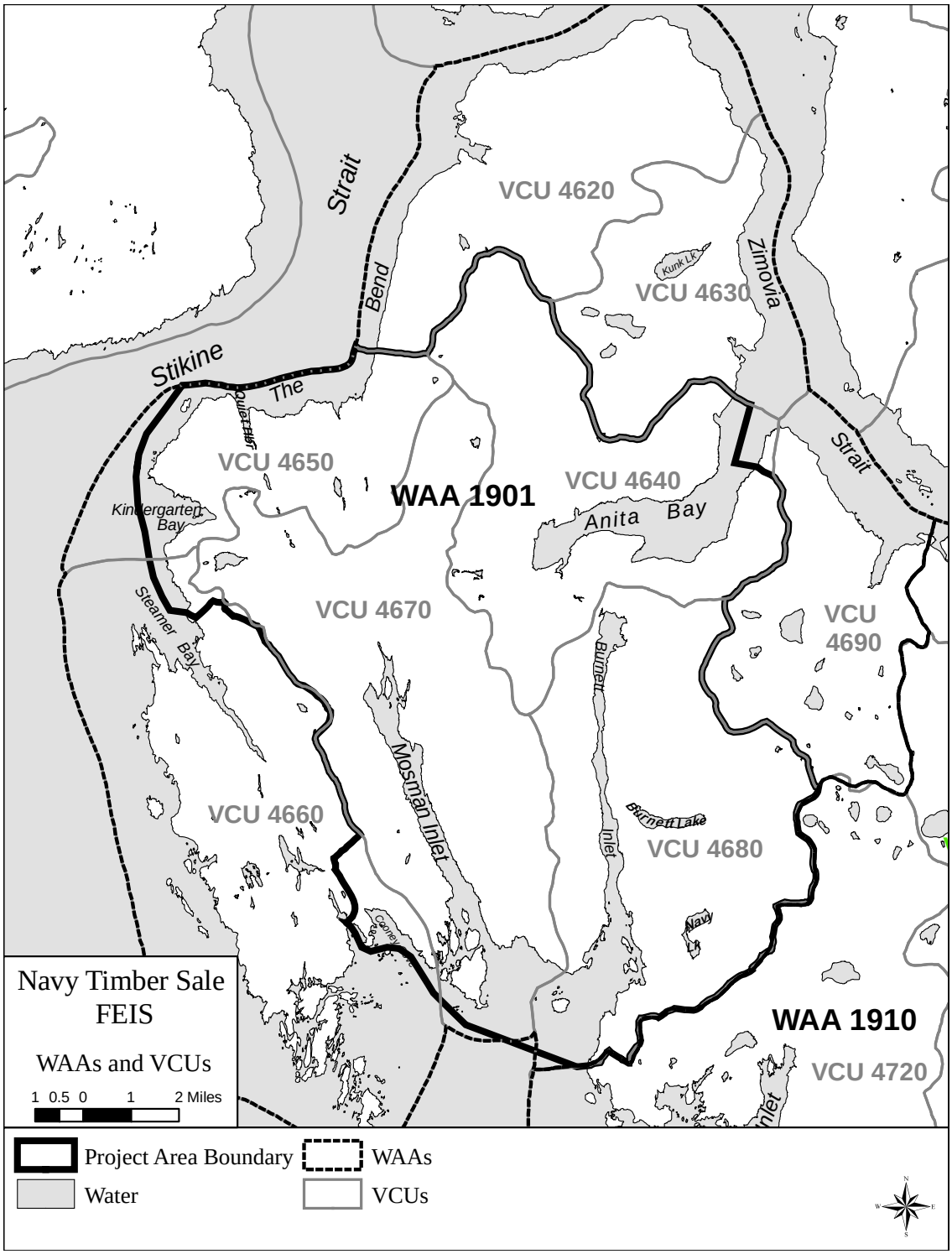
American Marten

Combined with previous timber harvest, implementation of the current project would result in a cumulative reduction in historical marten habitat capability in WAA 1901 of between 10 percent and 14 percent (Table 3-55) from pre-harvest condition. Marten should continue to exist in the current abundance and distribution patterns.

Bald Eagle

None of these alternatives proposes any road construction within the beach fringe, so there would be no long-term effects to bald eagle nesting and roosting habitat with any of these alternatives. All of these alternatives propose units where helicopter yarding would likely occur within ¼ mile of known eagle nests (Table 3-57). However, seasonal restrictions on helicopter yarding near active nests would be enforced in accordance with the Bald Eagle MOU, and should therefore minimize disturbance to these nests.

Figure 3-17
Wildlife Analysis Area Designations



Source: J:\fsfiles\office\gis\navy\plots\feis_plots9_2\wildlife_maps\waas_vcus.mxd

Sitka Black-tailed Deer

The Sitka black-tailed deer was chosen as an MIS because it is associated with old-growth forests, and is an important prey, game and subsistence species. This species receives the highest subsistence and sport hunting use of all mammals in Southeast Alaska. Research conducted in Southeast Alaska indicates that low-elevation, high-volume productive old growth habitats are particularly important to deer, especially during severe winters (Schoen et al. 1985, Hanley and Rose 1987, Yeo and Peek 1992). These mature old growth stands intercept snow, provide thermal cover, and support the largest biomass of herb and shrub forage for deer that is available during periods of heavy snow accumulation (Alaback 1982). Deer populations are impacted by the combination of deep-snow winters and the conversion of winter habitat to second growth. Snow reduces or eliminates forage availability in young clearcuts, while closed-canopy second-growth stands provide little forage (2008 Forest Plan Amendment Final EIS, pages 3-266). This analysis area has been classified as low and moderate snow zones, but even these zones can have periods of deep snow.

Deer Habitat Modeling

The current deer model assumes a linear relationship between habitat and capability. It calculates habitat suitability indices (HSIs) based on vegetation, aspect, elevation, and typical snowfall. There is controversy over the use of the interagency deer model developed during the 1997 Forest Plan process to evaluate potential winter habitat capability during project analyses (Forest Plan website http://www.fs.fed.us/r10/tongass/). The 2008 Forest Plan Final EIS used a revised version of this model. Differences between the two models are summarized in the wildlife resource report. Average snow levels expected for the area under consideration and the volume strata/size-density model system used in the 2008 Forest Plan Final EIS are applied in this analysis. Other factors, such as predator/prey interactions; severe winters and other catastrophic events; birth/mortality rates; habitat patch size; juxtaposition of habitats; and competition with other herbivores such as elk and moose, are not part of the model but were considered by the project biologist during effects analysis.

HSI values range from zero in areas that have no value as winter habitat to 1.0 in optimal habitat. Low-elevation, high-volume old-growth stands with southern aspects in low snowfall areas provide the best deer winter habitat and receive the highest possible score in the model. All habitat above 1,500 feet elevation is assumed to have no value as winter habitat, because snow levels are expected to bury forage. An HSI of 1.0 (high-volume strata, low elevation, south aspect, low average snow levels) represents a habitat capability of 100 deer/mile^2 (Person et al 1997, DeGayner 1995). The values generated by the deer model are used to estimate changes that result from timber harvest and do not reflect actual known deer numbers. They are used only for comparing potential effects to habitat capability among timber harvest alternatives. Although the coefficient of 100 deer/mile^2 has changed over the years, the current number is based on pellet count data in a moderate snow area in northern Southeast Alaska with no wolves present (2000 Tongass Monitoring and Evaluation Report, page 2-155, available from: http://www.fs.fed.us/r10/tongass/projects/tlmp/monitoring/2000monitor.html).

The model estimates habitat capability for different time periods. In the shrub-sapling stage (first 25 years after harvest), habitat capability in high-volume stands decreases

by about 42 to 95 percent, depending in medium and high snowfall areas. In low snow areas, habitat capability in medium- and low-volume stands increases after harvest by about 20 percent and 90 percent, respectively, due to increased forage availability in the shrub-sapling stage. During the stem exclusion stage (beginning at year 26 in the model), habitat capability is reduced 90 to 98 percent from the original stand value, regardless of snowfall, aspect, and elevation. The greatest and longest lasting impacts to habitat capability are those that occur during the stem exclusion stage. These are the effects discussed in the cumulative effects section.

The habitat capability model assumes that all timber harvest is done using even-aged (clearcut) silvicultural systems. However, other silvicultural systems would be used on some harvest acres for this project. Therefore, the results of the model may overestimate the impact of timber harvest on deer habitat capability in partial-harvest areas. For the purposes of this analysis, any unit with a prescription of >50 percent basal area removal will be treated as a clearcut and referred to as clearcut. Where single-tree selection <30 percent basal area removal is prescribed, post-harvest volumes for these stands have been estimated based on predicted volume removal as estimated by stand exams. Non-federal ownerships, which comprise less than 1 percent of WAA 1901, are included in the analysis.

Affected Environment

The deer model estimates current habitat capability in WAA 1901 to be about 95 percent of the habitat capability that existed across the WAA prior to any timber harvest. These numbers are slightly different from the Forest Plan (2008 Forest Plan Final EIS, p. 3-370) due to updated project GIS information and inclusion of private land.

The deer model generates HSI scores ranging from 0.0 to 1.0. The range of HSI scores between 0.38 to 1.0 equate to the top 25 percent of the acres (quartiles) present in WAA 1901 prior to large-scale timber harvest, estimated at approximately 24,099 acres in 1900. These acres represent high-quality deer winter range and have been reduced by 7 percent by past harvest. Figure 3-18 shows the current distribution of quartiles in WAA 1901.

In addition to impacts predicted by the model, maintenance of forested corridors between low- and high-elevation areas is important for deer, as well as some other wildlife species. These corridors not only facilitate seasonal migration between winter and summer range, they also allow deer to take advantage of changing snow conditions, moving upslope as snow depth permits. This type of movement is more likely in old growth or older second growth due to the interception of snow by the canopy, but there is more forage available in old-growth stands. In young second growth, there is more snow accumulation, impeding movement.

Environmental Effects

Direct and Indirect Effects

Alternative A (No Action)

Alternative A will not reduce habitat capability. The decline in habitat capability caused as units harvested in the past continue to age and enter the stem exclusion phase is included under cumulative effects. No additional deer winter range habitat

will be harvested and no new roads will be built. This alternative would maintain current habitat conditions within the WAA and deer would not be affected. Wolves and hunters will continue to have access to deer at their current levels under this alternative, barring unforeseen circumstances unrelated to the project, such as severe winters or disease conditions.

Table 3-48
Sitka Black-tailed Deer Habitat Capability1 (and Percent Decline) by Alternative for WAA 1901

Time frame		Habitat Capability[1] (and Percent Decline) by Alternative					
	1900	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
0-25 years (% decline from 2007)	3,537 (NA)	3,346 (0%)	3,261 (2.5%)	3,200 (4.4%)	3,278 (2.0%)	3,261 (2.5%)	3,313 (1.0%)
26-150 years (% decline from 1900)	3,537 (0%)	3,274 (7.4%)	3,201 (10.6%)	3,074 (13.1%)	3,181 (10.1%)	3,173 (10.3%)	3,228 (8.7%)

[1] Habitat capability does not equal actual deer; it is used as a tool to compare alternatives 20 – 25 years reported as percent decline from existing condition; 26 – 150 years reported as percent decline below Alternative A, current condition, to eliminate cumulative effects of past harvest.
Source: J:\fsfiles\office\wrd\nepa_projects\navy\06_Resource_Folders\n_Wildlife\References\DeerWaas2008FP_all.xls.

Table 3-49
Acres in WAA 1901 by Quartile 0-25 Years Post Harvest

Quartile	Acres Post Harvest (0-25 years) by Quartile and Alternative					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Top Quartile (0.38-1.0) 1	21,494	20,338	19,730	20,542	20,423	21,071
Mid Quartile (0.21-0.37)	17,435	17,008	16,297	17,113	17,038	17,122
Low Quartile (0.13-0.20)	20,245	20,724	21,278	20,651	21,104	20,505
Bottom Quartile (0.01-0.12)	22,170	23,274	24,039	23,038	22,780	22,646

[1] Quartiles are based on all non-zero model scores
Source: J:\fsfiles\office\wrd\nepa_projects\navy\06_Resource_Folders\n_Wildlife\References\DeerWaas2008FP_all.xls.

Alternatives B-F

Among the action alternatives, Alternative C would have the greatest negative impact on deer in WAA 1901, with a 4.4 percent short-term reduction in carrying capacity, while Alternative F would have the least with a 1 percent reduction. Alternatives D, B, and E would have intermediate impacts (Table 3-48).

Alternative C would reduce the most acres of top quartile habitat (1,764 acres, an 8 percent reduction). Because these acres are some of the most important winter habitat, deer could be negatively impacted by this alternative. Alternative C also proposes the

most road construction which increases access to deer by hunters, although all of these roads are proposed for closure at the end of logging activities.

Alternatives B, D and E propose approximately the same reduction in top quartile habitat at roughly 4-5 percent. Alternative F would result in the least reduction of top quartile habitat, with a 2 percent decrease.

It is doubtful that any of these reductions in carrying capacity and top quartile habitat will have a significant impact on actual deer numbers since deer do not appear to be limited by habitat at this time, as there is no evidence of over-browsing on most areas of the island.

Alternative C proposes several large harvest areas with 0 to 15 percent retention that could significantly affect seasonal movement of deer. In particular, a group of settings in Units 109 through 113 creates a contiguous break in canopy cover of 317 acres that is 2 miles long. Parts of this opening have a prescription that would retain the trees less than 16 inches diameter at breast height (dbh), which would be roughly 15 percent of the basal area. Even if these trees could be grouped into elevational strips, their crowns would be too small to provide sufficient snow interception to facilitate deer movement to take advantage of changing snow conditions during the winter.

Cumulative Effects

Combined with previous timber harvest, implementation of the current project would result in a cumulative reduction in historical deer habitat capability in the WAA of between 7 and 13 percent, depending on alternative (Table 3-48). Negative effects would be expected mainly after a severe winter with all alternatives, including the No-action Alternative. The only other reasonably foreseeable future timber sales scheduled in WAA 1901 at this time are three small salvage sales proposed in the area that are not expected to change habitat capability.

A project proposal for the Wrangell District Roadside Timber Sales was added to the SOPA in January 2009 and scoping has begun. This project is designed for multiple small timber and fuelwood sales and microsales. It would harvest up to 5 MMBF of salvage and green timber along the existing road systems on Wrangell, Zarembo, and Etolin Islands over multiple years. The effects to deer habitat has not been anaylzed at this time. .

As the Wrangell District Access Travel Management Plan (ATMP) is implemented, roughly half of the currently open roads in WAA 1901 will be closed to vehicles. This will decrease hunter access to deer in the area. There are no reasonably foreseeable future projects proposed for non-National Forest System lands in the area.

Non-development LUDs, including neighboring areas such as the South Etolin Wilderness, may provide source populations which can disperse into and throughout WAA 1901 as habitat conditions allow.

Table 3-50
Acres Remaining in WAA 1901 by Quartile 26-150 Years Post Harvest

Quartile	Acres Post Harvest (26-150 years) by Quartile and Alternative						
	1900	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Top Quartile (0.38-1.0) [1]	24,099	21,453	20,298	19,634	20,502	20,366	21,030
Mid Quartile (0.21-0.37)	18,371	17,442	17,015	16,289	17,120	17,041	17,130
Low Quartile (0.13-0.20)	19,516	18,844	18,795	18,856	18,727	19,366	18,865
Bottom Quartile (0.01-0.12)	19,357	23,605	25,236	26,565	24,995	24,571	24,319

[1] Quartiles are determined from all non-zero model scores for pre-harvest condition
Source: J:\fsfiles\office\wrd\nepa_projects\navy\06_Resource_Folders\n_Wildlife\References\DeerWaas2008FP_all.xls.

Alternative A (No Action)

This alternative will not harvest any deer habitat. However, the habitat capability in WAA 1901 will decline another 2 percent from existing condition as past harvest enters the stem exclusion phase, resulting in a 7.4 percent cumulative reduction since the beginning of large-scale, commercial timber harvest. This alternative has a cumulative decline of about 11 percent in the top quartile (highest-quality deer winter range). This alternative would have the least negative effect on deer habitat capability of all of the alternatives. No roads would be constructed; however, several roads will be closed to vehicles with implementation of the Wrangell District ATMP, resulting in reduced access to deer by humans from the current level. Fragmentation will not be increased because of this alternative. Therefore, deer would continue to have the same access to the current old growth patches to help find forage and avoid predators during the winter.

All Action Alternatives

Actual deer numbers in WAA 1901 do not appear to be limited by habitat at this time. If the population were to increase and approach carrying capacity, with a cumulative reduction of 13-19 percent of the top-quartile habitat (2-8 percent more than would occur without continued timber harvest), deer may have slightly more difficulty finding forage in the winter months in those areas that receive higher snow fall. With fewer large patches of old growth and fewer elevational corridors to allow dispersal during periods of changing snow levels, deer may have more difficulty avoiding wolves in WAA 1901. Winter survival rates could decrease, resulting in fewer deer available to wolves and hunters. Effects could be larger than expected if a severe winter occurs because deer populations could have a long recovery (difficulty rebounding) due to reduced habitat quality and predator presence, compounded by competition for resources with the elk on the island.

Alternative B

As harvest proposed under Alternative B reaches the stem exclusion stage, this alternative would result in a cumulative decrease in habitat capability of 10.6 percent from the estimated habitat capability in WAA 1901 prior to large-scale, commercial timber harvest. This alternative would further reduce top-quartile habitat, for a cumulative decline of about 16 percent, roughly the same as Alternatives D and E.

Alternative B proposes 12.9 miles of new roads (NFS and temporary), but all of these roads as well as roughly half of the existing roads are proposed to be closed at the end of sale activities. The new roads would be available for deer hunters on foot, but, as

with all other alternatives, there will be a reduction in miles of road available to hunters using vehicles.

Alternative C

As harvest proposed under Alternative C reaches the stem exclusion stage, this alternative would result in a cumulative decrease in habitat capability of 13 percent and a cumulative decrease in top-quartile habitat of 19 percent from those estimated in WAA 1901 prior to large-scale, commercial timber harvest.

This alternative proposes the most new roads (27.7 miles NFS and temporary) and is the only alternative that proposes the Cooney Cove road system. These new roads would increase access for deer hunters on foot, but all of these roads, as well as roughly half of the existing open roads, are proposed to be closed to vehicles when sale activities are completed. This alternative would have the greatest negative impact to deer habitat capability among all of the alternatives.

Alternative D

As harvest proposed under Alternative D reaches the stem exclusion stage, this alternative would result in a cumulative decrease in habitat capability of 10.1 percent and a cumulative decrease in top-quartile habitat of 15 percent from those estimated in WAA 1901 prior to large-scale, commercial timber harvest, similar to Alternatives B and E.

This alternative proposes 10.2 miles of new roads (NFS and temporary), which would increase access for deer hunters on foot, but all of these roads, as well as roughly half of the existing open roads, are proposed to be closed to vehicles when sale activities are completed.

Alternative E

As harvest proposed under Alternative E reaches the stem exclusion stage, this alternative would result in a cumulative decrease in habitat capability of 10.3 percent from estimated habitat capability in WAA 1901 prior to large-scale, commercial timber harvest, and a cumulative reduction of 15 percent of the top-quartile habitat, essentially the same as Alternative F.

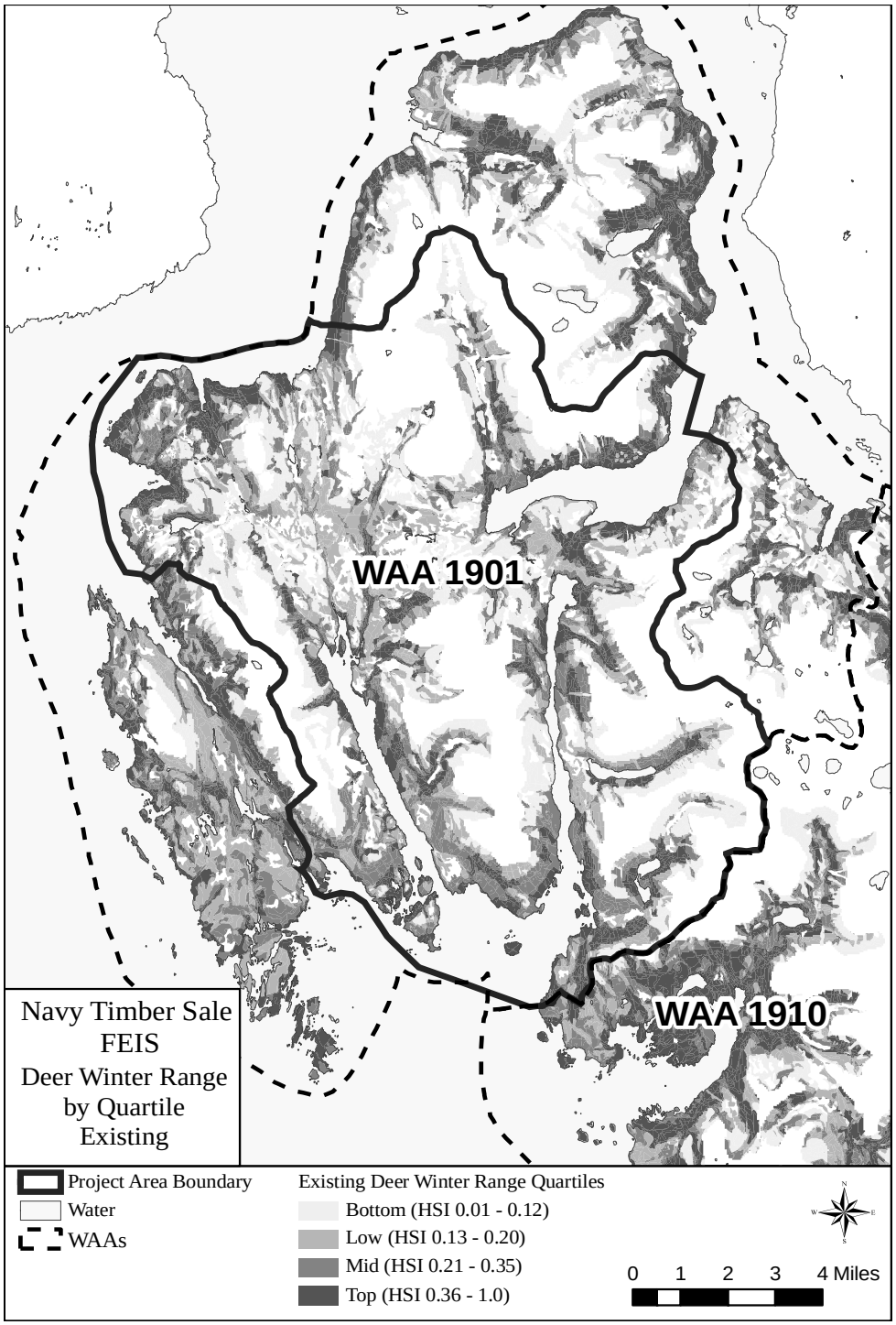
This alternative proposes 4.5 miles of new roads (NFS and temporary), which would increase access for deer hunters on foot, but all of these roads, as well as roughly half of the existing open roads, are proposed to be closed to vehicles when sale activities are completed.

Alternative F

As harvest proposed under Alternative F reaches the stem exclusion stage, this alternative would result in a cumulative decrease in habitat capability of 8.7 percent from estimated habitat capability in WAA 1901 prior to large-scale, commercial timber harvest and a cumulative reduction of 13 percent of the top-quartile habitat, the least of all the action alternatives.

This alternative proposes the fewest miles of new roads (4.5 miles), mostly short segments of temporary roads, which would negligibly increase access for deer hunters on foot, but all of these roads, as well as roughly half of the existing open roads, are proposed to be closed to vehicles when sale activities are completed.

Figure 3-18
Deer HSI Distribution Quartile, WAA 1901 and Adjacent Area



Source: J:\fsfiles\office\gis\navy\plots\feis_plots9_2\wildlife_maps\dwr_existing.mxd

Alexander Archipelago Wolf

The Alexander Archipelago wolf was chosen as a Tongass National Forest MIS because of population viability concerns and because trappers and hunters in Southeast Alaska actively pursue this subspecies of gray wolf. The decision by the USFWS not to list this subspecies as threatened under the Endangered Species Act was based in large part on the Forest Service's commitment to enhance habitat protection and population monitoring for the wolf. In Southeast Alaska, wolves inhabit the mainland and most large islands south of Frederick Sound. The population has been estimated at fewer than 1,000 individuals and as many as approximately 250 are harvested annually (Kirchhoff 1991). At least one wolf pack is known on Etolin Island, but no den sites have been found to date.

The Wolf Conservation Assessment (Person et al. 1996) identified three key issues that influence wolf populations in Southeast Alaska: 1) the loss of long-term carrying capacity for deer, due primarily to timber harvesting, 2) higher wolf mortality associated with increased human access from roads, and 3) continued high levels of wolf harvest by humans. Similarly, the Forest Plan identified the maintenance of adequate deer habitat capability and the control of road density and human access as key factors for maintaining viable, well-distributed wolf populations (2008 Forest Plan Final EIS, p. 3-281). Both sources agreed that maintaining long-term deer habitat capability is the most important consideration for wolf population viability.

Affected Environment

The number of wolves in a pack varies seasonally and among years. The size and number of packs on Etolin Island are unknown. Based on information provided by ADF&G biologists, it is estimated that the island could support three packs, 30 individuals (ADF&G, 2008, Draft EIS comment letter). In GMU 3, which includes Etolin Island, each hunter may legally harvest five wolves between August 1 and April 30. Wolves may also be trapped in GMU 3 from November 10 to April 30; there is no bag limit for trapping. Between 1986, and the spring of 2006, 102 wolves (5.7 per year) were legally harvested from Etolin Island (ADF&G, unpublished data). Mean number of wolves harvested during this period has been very similar in WAAs 1901 and 1910, 2.7 and 2.9 wolves per year, respectively. During the 2004-2005 hunting and trapping seasons, 18 wolves were harvested from Etolin Island, the highest recorded total since 1986.

Wolf-Deer Interactions

Sitka black-tailed deer are the principal prey of Alexander Archipelago wolves, and long-term viability of wolves is dependent on long-term deer habitat capability (Forest Plan Amendment Final EIS, pg 3-281). Forest Plan Standards and Guidelines for wolves recommend that deer habitat capable of sustaining both wolves and hunters should be maintained. On average, a habitat capability of 18 deer/mile^2 is needed to meet this guideline (2008 Forest Plan, pg. 4-95). The same model outputs described in the deer section above were used for the wolf analysis.

The 2008 Forest Plan Amendment Final EIS and the results of the deer model run for the analysis in this Final EIS both estimate a current deer habitat capability of 16 deer/square mile for WAA 1901. At this level, there could be a problem with either hunter success or wolf numbers. The model predicts habitat capability, not actual deer

numbers that often fluctuate due to weather, predation, hunter harvest and other factors. Hunter-days per deer harvested are comparable to nearby areas, indicating that there probably are still adequate deer on Etolin Island. Field surveys indicated low to moderate use of preferred forage species, indicating that the current deer population is below the carrying capacity and that winter habitat does not appear to be the main factor limiting actual deer population levels at this time.

Elk were introduced to Etolin Island in 1987 and are now well established on the island and several of the surrounding islands. It is not known to what extent wolves on the island rely on elk as prey, although wolf predation was documented with the early transplants. There is extensive overlap in the diet of deer and elk on the island (Kirchoff & Larsen 1998) so the deer model may serve as a close approximation of total herbivore biomass capability that would be available to wolves, since there are no models available to predict elk habitat capability for Southeast Alaska.

Road Density and Wolves

ADF&G wolf harvest records in GMU 3 indicate that the most common method of transport for hunters harvesting wolves is boating (average of 77 percent from 1988-2001), whereas other methods of transport that might use roads, including highway vehicles, off-highway vehicles, and snow machines are much less common (average of 21 percent from 1988-2001). The road systems on Etolin Island are isolated from communities, so hunting and trapping pressure is less than if the roads were connected to a community.

Roads, whether open or closed, increase human access to areas that were previously difficult to reach, especially when these roads are built in close proximity to human population centers. Roads may increase both legal harvest and illegal poaching of wildlife (2008 Forest Plan Amendment Final EIS, pg. 3-281). Person et al. (1996) reported that wolves in GMUs 2 and 3 experienced higher mortality from hunting and trapping in WAAs with higher road densities, and that harvest of wolves by humans increased twofold in WAAs where road density exceeded 0.7 mile/mile^2. The Forest Plan (page 4-95) suggests maintaining total road densities at or below 0.7 to 1.0 mile/mile^2 where wolf mortality is a concern. Wolf mortality has not been identified as a concern on Etolin Island.

Wolves spend most of their time below 1,200 feet elevation and Person et al. (1996) suggests calculating road density to reflect this, with total road density used in his calculations. This analysis discusses both open and total road density-for elevations below 1,200 feet. This analysis used known drivable status of roads to determine which were open and useable by motorized vehicles, regardless of the road management objective. Total road densities for the total area will be 60 percent of those shown in the tables for total roads below 1,200 feet elevation.

Road building associated with previous harvest activities has resulted in 61 miles of open road and 81 miles of total road below 1,200 feet elevation in WAA 1901. The total road density for the area below 1,200 feet elevation for WAA 1901 is 0.63 mile/mile^2 and an open road density of 0.48 mile/mile^2.

Environmental Effects

Direct and Indirect Effects

Availability of Primary Prey: Deer

All action alternatives for the Navy Timber Sale would slightly reduce deer habitat capability in the short and the long term (Tables 3-49, 3-50). The impacts of proposed timber harvest on deer habitat capability (in WAA 1901, 0-25 years after harvest), and therefore wolves, would be greatest under Alternative C, and least under Alternatives E and F, with the other alternatives intermediate in effects.

Alternative C proposes the most road construction, and a new LTF and roads in the Cooney Cove area. This alternative also proposes a major break in elevational travel corridors near Kindergarten Bay (Units 109-113), potentially impacting deer viability and vulnerability to wolf predation in that area. Therefore, this alternative has the greatest potential to affect the prey base (deer) for wolves and to increase human access to the project area. The combination of these factors could increase hunting and trapping take on wolves while decreasing the primary food source of wolves. Therefore, the wolf population in WAA 1901 could decrease.

Table 3-51
Deer[1] per Square Mile for WAA 1901 and Etolin Island 0-25 Years Post Harvest

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
WAA 1901	16.2	15.7	15.5	15.8	15.7	16.0
Etolin Island	17.2	16.9	16.8	17.0	16.9	17.1

[1] Based on interagency deer model; these numbers are presented for comparison purposes only; they do not reflect actual, known numbers or densities of deer.
Source: J:\fsfiles\office\wrd\nepa_projects\navy\06_Resource_Folders\n_Wildlife\References\DeerWaas2008FP_all.xls.

Road Impacts and Human Harvest of Wolves

All of the action alternatives in this project propose building roads to access timber, although all new roads and some existing roads are proposed for closure following timber harvest activities. This would increase total road density but reduce open road density.

This analysis assumes that all temporary roads will be closed and not accessible for motorized use after proposed activities are completed. The miles of open road by alternative include all new system roads, even though all new roads and many existing roads are proposed to be closed after harvest activities are completed. This assumption errs on the side of caution because these newly constructed NFS roads could be open for an extended period, during which time they could have a significant impact on wolves.

All of the action alternatives propose increases in total road density, ranging from 5 percent to 32 percent (Table 3-52). Open road density would not exceed 0.7 mile/mile^2 in WAA 1901 under any of the alternatives. Total road density below 1,200 feet elevation in WAA 1901 would reach or exceed 0.7 mile/mile^2 under Alternatives B, C and D, but would remain below 1.0 mile/mile^2. Increased road access could increase the human harvest of wolves, especially short term during the

active phases of the project, before planned road closures are implemented. However, long-term effects to wolves from road density are expected to be minimal, especially since the roads are not connected to a community.

Table 3-52
Road Density Below 1,200 feet Elevation by Alternative in WAA 1901

	Density[1]/Percent Change By Alternative											
	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
Open Road Density[2]	0.48	0%	0.53	10%	0.57	19%	0.52	8%	0.49	2%	0.49	2%
Total Road Density[3]	0.63	0%	0.72	14%	0.83	32%	0.70	11%	0.67	6%	0.66	5%

[1] Calculated as miles of road per square mile below 1,200 feet elevation.
[2] Open road density includes any roads currently existing and drivable plus proposed NFS roads.
[3] Total road density includes all NFS and temporary roads, whether or not they are drivable.
Source: J:\fsfiles\office\wrd\nepa_projects\navy\06_Resource_Folders\n_Wildlife\References\etolin_allroads_byWAAelev1200mc2. xls

Cumulative Effects

The only other present or reasonably foreseeable management activities that could affect wolves on Etolin Island are three small salvage sales and the implementation of the Wrangell ATMP. The salvage sales mostly involve windthrown or dead/dying trees and limited harvest of green standing trees, so should have negligible effects on deer winter range and do not involve the construction of any new roads, hence, should have no negative impact on wolves. The Wrangell District Roadside Timber Sales project is designed for multiple small timber and fuelwood sales and microsales. The effects to The effects on deer habitat are not known at this time.

The ATMP would result in the closure of approximately half of the currently open roads on Etolin Island. In the long term, this should reduce the harvest of both deer (the wolves' main prey) and wolves themselves, as motorized access would reduce immediately, and foot access would decrease as brush closes the roads.

New road systems proposed on Etolin Island could result in increased harvest of wolves, especially over the short term. This likelihood would be greatest under Alternative C and least for Alternative F, with the other alternatives intermediate in road effects (Tables 3-52 and 3-53). Both open and total road densities would still be well below the suggested 0.7 mile/mile^2 under all of the alternatives for WAAs 1901 and 1910 combined (all of Etolin Island and adjacent islands). Alternatives with higher road densities would provide greater access for both legal and illegal harvest of wolves on Etolin Island. However, since wolves have large home ranges, the presence of the South Etolin Wilderness Area and, to a lesser extent, the Kunk and Steamer MOGRs, provide possible refugia for wolves and these areas could serve as a source for repopulating the developed areas of the island, should occasional high harvest of wolves occur. Long-term effects to wolves are not expected because of increased road access under the action alternatives, although a short-term increase in hunting and trapping may occur during the active phases of the project.

Table 3-53
Long-term Road Density Below 1,200 feet Elevation by Alternative for WAAs 1901 and 1910 (Etolin Island and Adjacent Small Islands)

	Density[1]/Percent Change By Alternative											
	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
Open Road Density[2]	0.26	0%	0.29	12%	0.31	19%	0.28	8%	0.27	4%	0.27	4%
Total Road Density[3]	0.35	0%	0.39	11%	0.45	29%	0.39	11%	0.36	8%	0.36	8%

[1] Calculated as miles of road per square mile below 1200 feet elevation in WAAs 1901 and 1910.
[2] Open road density includes roads open to motorized vehicles, after implementation of planned road closures.
[3] Total road density includes all NFS and temporary roads, whether or not they are drivable.
Source: J:\fsfiles\office\wrd\nepa_projects\navy\06_Resource_Folders\n_Wildlife\References\etolin_allroads_byWAAelev1200mc2. xls.

At both the WAA 1901 scale, as well as the scale of Etolin Island, prey availability as estimated by the 2008 deer habitat capability model will below the level (18 deer/mi^2) suggested to maintain healthy populations of wolves while meeting hunter demand for deer during the stem exclusion stage, 26-150 years from now (Table 3-54).

Table 3-54
Deer[1] per Square Mile for WAA 1901 and Etolin Island 26-150 Years Post Harvest

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
WAA 1901	15.8	15.3	14.8	15.4	15.3	15.6
Etolin Island	17.0	16.7	16.4	16.7	16.7	16.9

[1] Based on 1997 interagency deer model; these numbers are presented for comparison purposes only; they do not reflect actual, known numbers of deer.
Source: J:\fsfiles\office\wrd\nepa_projects\navy\06_Resource_Folders\n_Wildlife\References\2008_0709_deer_all_WAA1901.xls and 2008_0709_deer_all_Etolin.xls.

All Alternatives

None of the alternatives, including the No Action, meets the Forest Plan recommended deer density of 18 deer/mile^2, deemed sufficient to meet the needs of both hunters and wolves. Alternative A would result in the least and Alternative C would result in the greatest reduction of prey habitat capability as past harvest enters the stem exclusion stage. The other alternatives would result in intermediate levels of reduction, although the differences between alternatives are small. With the uncertainty in determining deer habitat capability (deer density), Alternative A provides the best chance for providing sufficient deer for both wolves and human harvest.

Because Alternative A proposes no new road building, it presents the least risk of providing access that could lead to over-harvest of wolves in the area. Alternative C would result in the greatest risk for increased harvest of wolves since it proposes the most miles of new roads, especially in the short term, before the proposed closure of these roads. All of the proposed new roads are proposed for closure after harvest activities are complete. With all alternatives, roughly half of the existing open roads

are being closed with the implementation of the ATMP, which should result in reduced harvest of wolves, especially over the long term as the closed roads brush in and even foot access on these roads becomes difficult.

American Marten

The American marten was chosen as a Tongass National Forest MIS because it represents species requiring old-growth habitat and is an important furbearer. Like deer, marten are dependent on high-quality winter habitat, which consists of low-elevation (below 1,500 feet), high-volume old-growth forest, especially in coastal and riparian areas. These habitats intercept snow, provide cover and denning sites, and provide habitat for prey species.

Affected Environment

Marten Habitat Modeling

The interagency marten model (Suring et al. 1992) was used to evaluate marten habitat capability and to estimate potential impacts of timber harvest. The model calculates HSIs based on timber volume strata (high, medium, low), elevation, and landscape position (riparian versus upland area). Low-elevation, high-volume old-growth stands, especially in beach fringe or riparian areas, provide the best marten winter habitat. HSI values range from 0.0 in areas that have no winter habitat value to 1.0 in optimal habitat. These values are used to estimate changes in habitat capability that could result from timber harvest.

The habitat capability model assumes that all timber harvest is accomplished using even-aged (clearcut) silvicultural systems. Where single-tree selection (STS) that harvests less than 35 percent of the basal area is prescribed, post-harvest volumes for these stands have been estimated based on predicted volume removal as estimated by stand exams. Non-National Forest System lands make up less than 1 percent of WAA 1901 and are included in the analysis. The marten model estimates current habitat capability in WAA 1901 at 92 percent of the historic (pre-harvest) condition.

Road Density and Marten

Marten are easily trapped and can be over-harvested, especially where trapping pressure is heavy and not effectively controlled. This corresponds closely to the availability of road access. Because of their susceptibility to trapping, marten densities begin to decline in areas where road density exceeds 0.2 mile of road per square mile of land. Marten density may be reduced as much as 90 percent when road density approaches 0.6 mile/ mile^2 (Suring, et al 1992). This impact is expected to be greater where roads are connected to a community, but there is no quantitative information available on the difference in impact between connected and un-connected roads.

Currently, there are approximately 81 miles of open and closed (both system and temporary) roads in WAA 1901, mostly concentrated in the lower-elevation areas, resulting in a density of 0.29 mile/mile2 of total area. None of these is connected to a community.

From regulatory years 1996 to 2005, ADF&G documented 133 marten harvested from WAA 1901, compared to only 25 marten from WAA 1910 (South Etolin Wilderness). Marten harvest was particularly high in 1996 and 1997 (55 and 50 animals

documented, respectively), and has not exceeded eight animals any year since then. The cause of the reduced marten harvest is unclear, but harvest levels are generally tied to fur prices and winter weather. ADF&G considers marten populations in GMU 3 to be common to abundant and stable and harvest numbers moderate (ADF&G Furbearer Report, 2004).

Environmental Consequences

Direct, Indirect and Cumulative Effects

Marten Habitat Modeling

The action alternatives propose harvesting timber that would result in 1-6 percent further reduction in current marten habitat capability in WAA 1901, over the long term, from estimated conditions in 1900 (Table 3-55). The greatest impact would result from Alternative C, the least impact from Alternative F, and the rest of the alternatives would have an intermediate impact. There are three small salvage sales slated for the area, but these primarily involve windthrown or dead/dying trees and small amounts of standing live trees along the existing road system, so should not substantially change habitat capability in the WAA.

A project proposal for the Wrangell District Roadside Timber Sales was added to the SOPA in January 2009 and scoping has begun. This project is designed for multiple small timber and fuelwood sales and microsales. It would harvest up to 5 MMBF of salvage and green timber along the existing road systems on Wrangell, Zarembo, and Etolin Islands over multiple years. The effects to marten habitat have not been analyzed at this time but would be limited to areas adjacent to the existing roads.

Non-National Forest System lands were incorporated in this analysis, but comprise less than 1 percent of the area, and no known activities that would measurably reduce marten habitat capability are scheduled in these areas at this time. Combined with previous timber harvest, implementation of the current project would result in a cumulative reduction in historical marten habitat capability in WAA 1901 of between 10 percent and 14 percent (Table 3-55) from pre-harvest condition.

Table 3-55
Percent Reduction in High-value Habitat and Habitat Capability for Marten in WAA 1901 by Alternative Compared to Historic and Existing Conditions

	Habitat Capability 26-150 Years Post-harvest as Percentage of Pre-harvest Condition[1]	Amount of High-value[2] Marten Habitat (Percent Remaining)
1900	237 (100%)	28,232 (100%)
Current Condition	219 (92%)	24,113 (85%)
Alt. A	217 (91%)	24,113 (85%)
Alt. B	211 (88%)	22,628 (80%)
Alt. C	207 (86%)	21,536 (76%)
Alt. D	213 (89%)	22,939 (81%)
Alt. E	213 (89%)	22,538 (80%)
Alt. F	215 (90%)	23,530 (83%)

1Based on interagency marten model.
2 High-value habitat is HSI values greater than or equal to 0.9.
Source: J:\fsfiles\office\wrd\nepa_projects\navy\06_Resource_Folders\n_Wildlife\References\2008_0627_marten_all.xls.

Road Impacts and Human Harvest on Marten

All of the action alternatives in this project propose building roads or short extensions of roads to harvest timber, although all of these roads, plus some existing open roads, are proposed for closure after logging activities are completed. Under all alternatives, road density (both open and total) would exceed 0.2 mile/mile^2 (Table 3-56). The highest total road density would reach 0.51 mile/mile^2 under Alternative C and the least would be under Alternative F at 0.40 mile/mile^2. The other alternatives would have intermediate road densities. The open road density shown in the table is the maximum that would be open during logging activities. Full implementation of the Wrangell ATMP would result in closure of roughly half of the roads that are currently open in WAA 1901, resulting in an open road density of approximately 0.15 mile/mile^2. With all action alternatives, trapping pressure could increase during the active phases of road construction and logging when there may be an increase in trapping due to convenience and a temporary increase in the miles of open roads. Since the trapping season generally does not coincide with logging activities, this increase in trapping pressure would be most likely to happen if log camp facilities were made available to trappers.

Table 3-56
Road Density by Alternative in WAA 1901

	Density[1]/Percent Change By Alternative											
	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
Max. Open Road Density[2]	0.29	0%	0.33	46%	0.35	50%	0.32	29%	0.30	29%	0.30	11%
Total Road Density[3]	0.39	0%	0.44	33%	0.51	40%	0.43	19%	0.41	19%	0.40	12%

[1] Calculated as miles of road per square mile for all of WAA 1901.
[2] Open road density includes any roads currently existing and drivable plus proposed system roads.
[3] Total road density includes all system and temporary roads, whether or not they are drivable.
Source: J:\fsfiles\office\wrd\nepa_projects\navy\06_Resource_Folders\n_Wildlife\References\etolin_allroads_marten. xls.

Alternative A (No Action)

This alternative would result in no additional roads and no further reductions in habitat capability for marten. This alternative is the least likely to negatively affect marten populations on Etolin Island. Access to marten by trappers would remain in its status. Marten should continue in similar abundance and distribution patterns as currently exist on the island, with no impacts expected to marten or trappers.

Alternative C

Alternative C proposes the greatest reduction in high-value marten habitat and construction of the most new roads. Total road density would increase by 30 percent in WAA 1901 to approximately 0.5 mile/mile2. Marten density may be reduced as much as 80 percent when road density approaches this level due to ease of access for harvest (Suring, et al 1992). High-value marten habitat would be reduced about 6 percent, for a cumulative reduction of 14 percent since historic times. Alternative C is the most likely to negatively affect marten populations in WAA 1901 through reductions in habitat capability and providing increased access for both legal and illegal harvest. However, trapping pressure on an island with no communities, such as Etolin, is unlikely to be influenced solely by the number of roads. Access to WAA 1901 is limited during the winter months (trapping season) by weather conditions, but marten are harvested here as noted by the harvest records. Decreased habitat in combination with increased access could lead to reduced marten populations, which could lead to reduced trapping success.

The proposed harvest of Units 109-113 would create a 2-mile long break in elevational corridors of the Kindergarten-Quiet Harbor block, affecting the ability of marten to disperse. This contiguous, 317-acre harvest area (0-15 percent retention) would result in a large reduction in total and interior POG in this block. Parts of this opening have a prescription that would retain the trees less than 16 inches dbh, which would be roughly 15 percent of the basal area. Even if these trees could be grouped into elevational strips, their crowns may be too small to provide cover for marten.

Alternative F

Among the action alternatives, Alternative F would have the least impact on marten habitat capability because it proposes the least amount of new road construction, and the smallest reduction in high-value marten habitat. High-value habitat is expected to

decline by 2 percent under this alternative, for a cumulative reduction of 18 percent. Marten should continue to exist in the current abundance and distribution patterns.

Alternatives B, D, and E

These alternatives are intermediate among the action alternatives, between Alternative C and Alternative F, in terms of their potential impacts on marten populations on Etolin Island. Alternatives B, D, and E all propose very similar reductions in habitat capability and high-value marten habitat relative to what was estimated to have been available in 1900. Existing high-value habitat would be reduced by 4 to 5 percent in these alternatives, for cumulative reductions of up to 22 percent since 1900. All of these would temporarily increase open road density and permanently increase total road density.

Bald Eagle

Bald eagles are protected by Federal law under the Bald and Golden Eagle Protection Act. In Southeast Alaska, most bald eagle nests are in old-growth trees within the beach fringe, with some nests along other large riparian areas. Eagles also prefer the shoreline for perching and winter roosting habitat. Nesting, perching, and winter roosting habitat for the bald eagle is protected by Forest Plan Standards and Guidelines, primarily beach and estuary buffers and riparian management areas, and with measures from a 2002 Memorandum of Understanding (MOU), between the USDA Forest Service and the U.S. Fish and Wildlife Service (USFS 2002).

The MOU established a minimum 330-foot radius management zone around all bald eagle nests. Activities within this zone are usually restricted to those that will not disturb a nesting pair. The zone remains in effect even if the nest is inactive or lost. In addition, repeated helicopter flights (especially those used for yarding timber) should be avoided within ¼ mile of all active nests and blasting activities may be restricted within ½ mile of active nests. All nests are considered active from March 1 through May 31 as this is the nest site selection period. From June 1 through August 31, active nests are those with known eggs, nestlings, or those where adults are observed in nesting activities.

Affected Environment

There are 17,805 acres of beach and estuary fringe habitat in WAA 1901. In addition, a ½ mile radius around each known nest in the bald eagle effects area was considered.

There are 146 bald eagle nest sites known to exist in WAA 1901. Which nests are active will be monitored and determined during each season in which operations occur.

There are approximately 4.04 miles of existing roads (including both system and temporary roads) in the beach fringe in WAA 1901. There are 34 nests within ½ mile of existing system or temporary roads. There is one known eagle nest within ½ mile of both of the existing Anita Bay LTFs, and within ¼ mile of the North Anita Bay LTF. WAA 1901 has been subject to past harvest, some of which was in the beach fringe. Harvest in the beach and estuary fringe reduced the amount of POG habitat important for bald eagles. Project planning for all of the beach harvest was completed

prior to implementation of the current Forest Plan, and therefore standards and guidelines requiring a 1,000-foot beach fringe did not apply. Many managed stands in the beach fringe have few or no trees of a suitable size for bald eagle nests, though a few nests occur in these areas (approximately 5 percent of nests in the bald eagle effects area).

Environmental Consequences

Direct and Indirect Effects

Current Forest Plan Standards and Guidelines do not allow for programmed timber harvest within the 1,000-foot wide beach and estuary fringe, so no further reduction in bald eagle nesting, perching, or winter roosting habitat would occur because of timber harvest. All known eagle nests are more than 700 feet from the nearest proposed harvest units. The Interagency Bald Eagle MOU provides additional protection to bald eagle nest sites. Helicopter yarding is not permitted within ¼ mile of any active eagle nests, and blasting for rock pits or road construction is not permitted with ½ mile of active nests. Effects to bald eagles are therefore expected to be minimal. Field surveys will be completed prior to implementation to determine activity status of nests. Units and roads that will need eagle protection are noted on unit and road cards.

Table 3-57
Bald Eagle Habitat Effects

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Miles of proposed roads through beach fringe[1]	0	0	0.34	0	0	0
Number of nests where helicopter yarding restrictions may apply	0	10	22	3	20	0
Number of nests where variance to MOU may be necessary [2, 3]	0	3	6	3	3	2

[1] Includes all roads, both NFS and temporary.
[2] Variances will be necessary for roadside vegetation clearing within 330 feet of nests.
[3] Variances may be necessary if new road construction requires blasting that can not be accomplished outside of the seasonal restrictions.
Source: Wrangell Ranger District GIS.

Alternative A

Alternative A proposes no timber harvest, road construction, blasting, or helicopter yarding. This alternative would have no effect on bald eagles.

Alternative C

Alternative C proposes construction of a new road in the beach and estuary fringe that would affect bald eagle nesting and roosting habitat.

This alternative proposes 22 units where helicopter yarding will likely occur within ¼ mile of known eagle nests (Table 3-57). Seasonal restrictions on helicopter yarding near active nests will be enforced in accordance with the Bald Eagle MOU and should therefore minimize disturbance to these nests.

Alternatives B, D E and F

None of these alternatives proposes any road construction within the beach fringe, so there would be no long-term effects to bald eagle nesting and roosting habitat with any

of these alternatives. All of these alternatives propose units where helicopter yarding would likely occur within ¼ mile of known eagle nests (Table 3-57). However, seasonal restrictions on helicopter yarding near active nests would be enforced in accordance with the Bald Eagle MOU, and should therefore minimize disturbance to these nests.

All Alternatives

While individual eagles could be affected by proposed activities, and disturbances allowed under variances could result in nest abandonment, these alternatives should not contribute to an overall reduction in bald eagle populations. The documented eagle nest near the North Anita Bay LTF would require a seasonal restriction on use of the old logging camp near this LTF for helicopter staging with any of the action alternatives. This nest would also require a seasonal restriction on blasting at either of the Anita Bay LTFs.

Cumulative Effects

Cumulative effects for bald eagle were analyzed for WAA 1901, the same scale as for direct effects. All non-National Forest System lands were included in the analysis. Eagles generally use the same habitat throughout the year. Since activity restrictions pertain to the area surrounding nests, it is necessary to analyze a larger scale than the vicinity of the proposed project.

The implementation of the Wrangell District ATMP will close several miles of road in WAA 1901, but very little of the existing road is located within the 1,000-foot beach fringe. No other reasonably foreseeable projects in the cumulative effects area should affect bald eagles.

Prior harvest has led to a 6 percent reduction in potential bald eagle nesting habitat in the beach and estuary fringe in WAA 1901. This habitat will gradually return to eagle nesting and roosting habitat over the next 150 years. Once the beach buffer has fully recovered to POG, eagle habitat in the wildlife effects area will approximate that of historic conditions. Current Forest Plan Standards and Guidelines do not allow for programmed timber harvest within the 1,000-foot wide beach and estuary fringe, so impacts to bald eagle habitat will be limited to locations where roads or LTFs are proposed within the beach fringe as described above. In addition, the MOU between the Forest Service and the USFWS provides protection to bald eagle nest sites.

A project proposal for the Wrangell District Roadside Timber Sales was added to the SOPA in January 2009 and scoping has begun. This project is designed for multiple small timber and fuelwood sales and microsales. It would harvest up to 5 MMBF of salvage and green timber along the existing road systems on Wrangell, Zarembo, and Etolin Islands over multiple years. The effects to bald eagle habitat have not been analyzed at this time but would be limited to areas adjacent to the existing roads and would not affect the beach fringe.

Threatened, Endangered, and Sensitive Species

Threatened and Endangered Species

As part of the National Environmental Policy Act (NEPA) decision-making process, proposed Forest Service programs or activities are to be reviewed to determine how a proposed action would affect any threatened, endangered, proposed or sensitive species. This effects analysis is required to address direct, indirect and cumulative effects of an action on threatened or endangered species or their critical habitat (50 CFR 402.02) and on sensitive species or their habitat (FSM 2672.42).

In compliance with the Forest Plan and the Endangered Species Act, species that are listed by the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) as threatened, endangered or proposed (TEP) for this area were identified. Threatened and endangered species potentially occurring in the project area were identified through consultation with the USFWS and the NMFS species list. No species proposed for listing were identified. The only listed threatened or endangered species known to occur in or near the project area are Stellar sea lions and humpback whales. There are no known sea lion rookeries or haul outs in the project area. There is one small sea lion haul out on the north end of Etolin Island, outside of the project area. While these marine mammals may experience some disturbance during logging activities due to increased boat and barge traffic, there are no long-term impacts expected.

Sensitive Species

Sensitive species are those wildlife, fish and plant species identified by the Regional Forester for which population viability is a concern, as evidenced by a significant current or predicted downward trend in population numbers, density, or in habitat capability that would reduce a species' existing distribution (FSM 2670.5). The Regional Forester's sensitive species list was undergoing revision during the analysis for the Navy Project. The Regional Forester signed the revised list on February 2, 2009. The revised list does not include several animals analyzed in the biological evaluation for this project. The list no longer includes trumpeter swan, American osprey, and Peale's peregrine falcon.

Furthermore, it added two species that may occur within the project area but are unlikely not be affected by the project's activities. These species are black oystercatcher and Aleutian tern.

The only sensitive species known to occur in the project area that could be impacted by this project is the Northern goshawk. This species forages in a variety of habitats, but is only known to nest in old-growth forests. There are seven known nests within the Navy project area. Since goshawks will reuse nests in subsequent years, all known nests have been protected by buffers as prescribed in the Forest Plan Standards and Guidelines. The Tongass Conservation Strategy is designed to preserve enough old-growth habitat to maintain viable populations of all old-growth associated species, including goshawks. Since goshawks require old-growth forest for nesting, any timber harvest could remove potential nesting habitat. The more acres of old-growth forest harvested, the greater the risk of affecting existing or potential goshawk nesting habitat. Therefore, of the action alternatives, Alternative F would have the least potential impact and Alternative C would have the greatest potential impact on goshawk nesting habitat. The analysis area for goshawks is WAA 1901.

Affected Environment

Northern goshawks use a variety of habitats for foraging but are only known to nest in productive old growth or mature forest. High-probability nesting habitat is high-volume, low-elevation (<800 feet elevation) and gentle slopes (<35 percent), although they will often use stands not meeting these criteria, or in patches of trees that meet these criteria, but are too small to map. For this reason, this analysis will look at both high-probability goshawk nesting habitat and all productive old growth.

Prior to any timber harvest, there were 66,219 acres of productive old growth in WAA 1901, of which 9,378 acres were high-probability nesting habitat. Currently, there are 60,750 acres of productive old growth in WAA 1901, of which 8,002 acres are high-probability nesting habitat. Of the seven known goshawk nests in WAA 1901, four occur in or very close to mapped high-probability nesting habitat.

Direct, Indirect and Cumulative Effects

All previously identified active goshawk nests have had buffers established around them, following the Forest Plan Standards and Guidelines. All proposed units lie outside of these established buffers. Late in 2008, a new, inactive nest was discovered just north of Unit 84 in an area where biologists, in 2006, had noted goshawks exhibiting aggressive, territorial behavior indicating a high likelihood of a nest in the area. Though the nest found in 2008 was inactive, goshawks were reported in the area, likely using a nearby alternate nest location. A buffer around this nest that meets Forest Plan Standards and Guidelines includes most of Unit 84. This unit occurs in Alternatives C and E; this unit, including the buffer, will be considered in the decision but would probably not be selected.

While attempts will be made to search for and protect goshawk nests, there is still a risk that timber harvest will destroy unidentified existing nests as well remove potential nesting habitat. It is not known if goshawks will nest in stands with partial harvest leaving at least 70 percent of the basal area. It is probable that for several years the stands will be too open, but should recover enough for goshawks to use the stands more quickly than clearcuts or stands with a higher percentage of harvest. To reflect this potential difference in impact, the following table shows the short-term impact with the assumption that any harvest would eliminate a stand as potential nesting habitat and long-term impact with the assumption that at some point in time the partial-harvest stands will be suitable nesting habitat. If, in the worst-case scenario, the partial-harvest stands do not become suitable nesting habitat, the short-term numbers would still hold true for the long term.

As can be seen in Table 3-58, there is very little impact to high-probability goshawk nesting habitat, even over the short term, which assumes that the partial-harvest stands would become unsuitable nesting habitat. The greatest impact would be with Alternative C, and the least with Alternative F.

Table 3-58
Potential Goshawk Nesting Habitat, by Alternative, for WAA 1901

	Acres Remaining (Percent Remaining of Pre-harvest)						
	1900	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
High-probability goshawk nesting habitat-short term[1]	9,378 (100%)	8,002 (85%)	7,562 (81%)	7,380 (79%)	7,627 (81%)	7,627 (81%)	7,854 (84%)
High-probability goshawk nesting habitat-long term[2]	9,378 (100%)	8,002 (85%)	7,735 (82%)	7,633 (81%)	7,727 (82%)	7,912 (84%)	7,859 (84%)
POG-short term	66,219 (100%)	60,750 (92%)	57,547 (87%)	54,655 (83%)	58,390 (88%)	57,422 (87%)	59,498 (90%)
POG-long term	66,219 (100%)	60,750 (92%)	59,556 (90 %)	58,330 (88 %)	59,581 (90 %)	60,264 (91 %)	60,192 (91%)

[1] Defined as high-volume strata, elevation < 800 feet, slope < 35 percent.
[2] Long term assumes that partial harvest stands become suitable nesting habitat sooner than clearcuts.
Source: Wrangell Ranger District GIS.

The only other reasonably foreseeable activities in the WAA are four small salvage sales, which should not have much impact on goshawk nesting habitat, since these stands are for the most part unsuitable nesting habitat.

Viewpoint 02a – Burnett Inlet

Chapter 4
Lists

Chapter 4

Lists

Preparers

The following is a list of contributors to the Navy Timber Sale Environmental Impact Statement. Other Forest Service employees contributed to the completion of this document through their assistance in support functions. Their help is greatly appreciated.

Interdisciplinary Team Members

Pat Haley, Project/IDT Leader (Final EIS)

Education
B.S. Forest Management, Oregon State University, 1980
Experience: 28 years with the Forest Service (since 1980)

Matthew Boisseau, Landscape Architect

Education
MLA, Texas Tech University, 1999; B.S. Recreation, Norwich University, 1992
Experience: 6 years professional experience (3 years with the Forest Service)

Melissa Cady, Wildlife Biologist

Education
B.A., Biology; M.S., Wildlife Biology
Experience: 10 years experience (5 years with the Forest Service)

Tom Cady, Fisheries Biologist

Education
B.A. Zoology; M.S. Zoology
Experience: 13 years experience (8 years with the Forest Service)

Jackie deMontigny, Soil Scientist

Education
B.A., Education; M.S., Forest Ecology
Experience: 16 years with the Forest Service

Gina Esposito, Archaeologist

Education
B.A., Anthropology
Experience: 8 years with the Forest Service

Dee Galla, Recreation Planner

Education
B.S., Wildland Recreation Management
Experience: 16 years with the Forest Service

Tom Heutte, Botanist
Education
B.S. Botany, University of Maryland, 1986; GIS Cert.. Penn State University, 2008
Experience: 6 years with the Forest Service

Robert M. Reed, Forestry Technician (Certified Silviculturist)
Education
B.S., Forestry
Experience: 21 years with the Forest Service

Greg Roberts, Forester
Education
B.S., Forestry
Experience: 15 years with the Forest Service

Jane Smith, Archaeologist
Education
B.S., Anthropology
Experience: 25 years experience (16 years with the Forest Service)

Austin O'Brien, District Timber and Fire Staff
Education
B.S., Forest Resources Management
Experience: 21 years with the Forest Service

Quentin Smith, Transportation Planner
Education
B.S., Civil Engineering
Experience: 5 years experience (3 years with the Forest Service)

Julianne Thompson, Hydrologist
Education
B.S., Natural Resources Management – Wildland Hydrology; Graduate Study in Watershed Science
Experience: 17 years with the Forest Service

Kevin Weinner, Hydrological Technician
Education
B.S., Watershed Management
Experience: 7 years professional experience (5 years with the Forest Service)

Susan Wise-Eagle, Geographic Information Systems (GIS)
Education
B.S., Zoology
Experience: 27 years with the Forest Service

Frank W. Roberts, Planning Staff (previous)
Education
B.S., Forestry
Experience: 28 years with the Forest Service

Jamie Roberts, Project/IDT Leader (previous)
Education
B.S., Forest Management
Experience: 8 years with the Forest Service

Robin Beebee, Hydrologist (previous)
Education
B.A., Geosciences; PhD, Geological Sciences
Experience: 4 years with the Forest Service

Joni Johnson, Forest Ecologist (previous)
Education
B.S., Natural Resources; M.S., Plant Biology
Experience: 5 years with the Forest Service

Cathy Tighe, Wildlife Biologist (previous)
Education
B.S., Biology
Experience: 14 years with the Forest Service

Karl Welch, Forester (previous)
Education
B.S., Forest Management
Experience: 7 years with the Forest Service

Other Contributors
Tyler Cole, Aquatics Specialist
Karen Dillman, Forest Ecologist
Sandy Powers, Writer-Editor
Sha Ervin, Writer-Editor

4 Lists

Distribution List

A copy of the Navy Timber Sale Final EIS was sent to the following agencies, organizations, businesses, public officials, municipalities and IRA tribes. These parties either commented on the project, requested a copy of the EIS at some time in the NEPA process, are part of the Forest Service's mandatory mailing list (Forest Service Handbook 1909.15, Sections 23.2 and 63.1) or are recognized municipalities or IRA tribes potentially affected by, or interested in, the Navy Timber Sale project.

Individuals Sent a Copy of the Final EIS

Peter Branson
Emil Churchill
Barney Freedman, Thorne Bay, AK
James Denison, Long Beach, CA
Eric Lee
John Jensen
Hope Merritt/Daniel Thompson
Bernie C. Klemanek
Dolores Loucks
Pat Roppel
Bill Privett, Wrangell, AK
Jim Steitz, Las Cruces, NM
Edward R. Ule
E. F. Wood
B. Sachau, Florham Park, NJ

Agencies, Organizations, Businesses, Municipalities, and Tribes

Kevin J. Hanley, AK State DEC, Juneau, AK
Boyd Porter, AK State Dept. Fish & Game, Ketchikan, AK
Michael Curran, AK State DNR Div. of Forestry, Ketchikan, AK
Director, Planning and Review, Adv. Council on Historic Preservation, Washington, DC
Gov. Sarah Palin, State of Alaska, Juneau, AK
Owen Graham, Alaska Forest Association, Ketchikan, AK
George Woodbury, Alaska Forest Association, Wrangell, AK
Brian McNitt, Alaska Rainforest Campaign, Sitka, AK
Doug Fleming, AK State Dept. Fish & Game, Petersburg, AK
Rich Lowell, AK State Dept. Fish & Game, Petersburg, AK
Karin McCoy, AK State Dept. Fish & Game, Juneau, AK
Judith E. Bittner, AK State DNR, Ofc. of History and Archaeology, Anchorage, AK
Jim Cariello, AK State DNR Habitat Division, Petersburg, AK
Claire Batac, Project Review Coordinator, AK State DNR, DCOM, Juneau, AK
Jim Anderson, AK State DNR, Juneau, AK
Mike Eberhardt, AK State DNR, Div. of Parks, Juneau, AK
Andy Hughes, SE Planning Manager, AK State DOT, Juneau, AK
Van Sunberg, Env. Analyst, AK State DOT, Juneau, AK
Alaska State Library, Juneau, AK
Cindy Shogan, Alaska Wilderness League, Anchorage, AK
Joseph Morgan, President, ANB Camp #4, Wrangell, AK
Ross Nannauck, President, ANB Camp #16, Petersburg, AK
Lovey Brock, President, ANS Camp #1, Wrangell, AK
Stanley Senner, Audubon Alaska, Anchorage, AK
Gabriel Scott, Cascadia Wildlands Project, Cordova, AK
Hon. Mayor Valerie McCandless, City of Wrangell, Wrangell, AK
Bob Prunella, City of Wrangell, Wrangell, AK
Craig Public Library, Craig, AK
Douglas Public Library, Douglas, AK
Tom Waldo, Earth Justice Legal Defense Fund, Juneau, AK

Elfin Cove Library, Elfin Cove, AK
Federal Aviation Administration, Anchorage, AK
Federal Highway Administration, Juneau, AK
Ed Williams, Four Dam Pool Agency, Anchorage, AK
Emily Platt, Gifford Pinchot Task Force, Portland, OR
Larry Edwards, Greenpeace, Sitka, AK
Haines Public Library, Haines, AK
Hollis Public Library, Hollis, AK
Hyder Public Library, Hyder, AK
Kake Community Library, Kake, AK
Kasaan Community Library, Kasaan, AK
Ketchikan Public Library, Ketchikan, AK
Kettleson Memorial Library, Sitka, AK
Klawock Public Library, Klawock, AK
Metlakatla Centennial Library, Metlakatla, AK
James Balsiger, National Marine Fisheries Service, Juneau, AK
Robert Mecum, National Marine Fisheries Service, Juneau, AK
Amy Mall, National Resources Defense Council, Washington, DC
NEPA Coordinator, NOAA Ofc. of Policy and Strategic Planning, Washington, DC
Mark Gregory, Oyster Alaska LLC, Ketchikan, AK
Pelican Public Library, Pelican, AK
Petersburg Public Library, Petersburg, AK
Mim McConnell, C/O Fred Clark, SE AK Regional Subsistence Council, Juneau, AK
Buck Lindekugel, SEACC, Juneau, AK
Michelle Metz, Sealaska Corporation, Juneau, AK
Sheldon Jackson Library, Sitka, AK
Marc Rorick, Sierra Club, Juneau, AK
Katherine Fuselier, Sierra Club Alaska Field Office, Anchorage, AK
Pat Joensuu, Silver Bay Logging, Wrangell, AK
Paul Olson, Sitka Conservation Society, Sitka, AK
Skagway Public Library, Skagway, AK
Rod Neterer, SSRAA, Ketchikan, AK
Tenakee Springs Public Library, Tenakee Springs, AK
Karen Hardigg, The Wilderness Society, Anchorage, AK
Thorne Bay Community Library, Thorne Bay, AK
Ernie Eads, Thuja Plicata Lumber Company, Thorne Bay, AK
Gregory Vickrey, Ketchikan, AK
John C. Leeds III, U.S. Army Corps of Engineers, Juneau, AK
U.S. Army Engineer Division, Pacific Ocean Division, Ft. Shafter, HI
U.S. Coast Guard, Environmental Management CG-443, Washington, DC
Hon. Sen. Ted Stevens, U.S. Congress, Juneau, AK
Director, Office of Env. Compliance, U.S. Department of Energy, Washington, DC
U.S. EPA, EIS Review Coordinator, Seattle, WA
Christine Reichgott, U.S. EPA, NEPA Review Unit Manager, Seattle, WA
U.S. EPA, Office of Federal Activities, Washington, DC
Hon. Rep. Don Young, U.S. House of Representatives, Washington, DC
Hon. Sen. Lisa Murkowski, U.S. Senate, Anchorage, AK
Wm. A. Egan Library, University of Alaska - SE, Juneau, AK
Brenda Johnson, US Geological Survey, Reston, VA
Forestry Services Library, USDA FS Info Alaska, Juneau, AK

USDA APHIS PPD/EAD, Riverdale, MD
Betsy Rickards, USDA Forest Service, Federal Building, RO, Juneau, AK
Charley Streuli, USDA Forest Service, Petersburg SO, Petersburg, AK
Cynthia Sever, USDA Forest Service, Petersburg SO, Petersburg, AK
Forest Supervisor, USDA Forest Service, Chugach National Forest, Anchorage, AK
Forrest Cole, USDA Forest Service, Ketchikan SO, Ketchikan, AK
Karen Iwamoto, USDA Forest Service, Sitka SO, Sitka, AK
Nancy Soriano, USDA Forest Service, Ketchikan SO, Ketchikan, AK
Planning Dept, USDA Forest Service, Hoonah RD, Hoonah, AK
Planning Dept, USDA Forest Service, Juneau RD, Juneau, AK
Planning Dept, USDA Forest Service, Yakutat RD, Yakutat, AK
Planning Dept, USDA Forest Service, Petersburg RD, Petersburg, AK
Planning Dept, USDA Forest Service, Craig RD, Craig, AK
Planning Dept, USDA Forest Service, Thorne Bay RD, Thorne Bay, AK
Regional Forester, USDA Forest Service, Federal Building, RO, Juneau, AK
Sandy Powers, USDA Forest Service, KetchikanSO, Ketchikan, AK
Planning Dept, USDA Forest Service, Ketchikan-MF RD, Ketchikan, AK
Sheila Spores, USDA Forest Service, Ketchikan SO, Ketchikan, AK
Sue Jennings, USDA Forest Service, Petersburg SO (Hoonah RD), Hoonah, AK
Planning Dept, USDA Forest Service, Sitka RD, Sitka, AK
National Environmental Coordinator, USDA Natural Resources Cons. Service, Washington, DC
Acquisitions & Serials Branch, USDA National Agricultural Library, Beltsville, MD
Richard Enriquez, USDI Fish & Wildlife Service, Juneau, AK
Bill Hanson, USDI Fish & Wildlife Service, Juneau, AK
Laverne Smith, USDI Fish & Wildlife Service, MS 361, Anchorage, AK
Pamela Bergmann, USDI Office of Env. Policy and Compliance, Anchorage, AK
Director, USDI Office of Env. Policy and Compliance, Washington, DC
Joel Hanson, Wrangell Cooperative Association, Wrangell, AK
Kay Jabusch, Wrangell Public Library, Wrangell, AK
Steven Todd, Wrangell Resource Council, Wrangell, AK

Glossary

Access
The opportunities to approach, enter, and make use of public lands.

Access Management
Acquiring rights and developing and maintaining facilities needed by people to get to and move through public lands.

Adfluvial Fish
Species or populations of fish that do not go to sea, but live in lakes, and enter streams to spawn.

Alaska Forest Resources and Practices Act (AFRPA)
Under the Alaska Forest Resources and Practices Act of 1979, as amended, Forest Service timber harvest projects satisfy the Coastal Zone Management Act (CZMA) consistency requirement if the Forest Plan and all related standards and guidelines applicable to the project provide no less resource protection than the AFRPA requires for timber harvest projects on State land, except that the AFRPA specifies a different minimum riparian standard for Federal projects than for State projects. The Forest Plan Standards and Guidelines and mitigation measures described in Chapters 2 and 3 of this document meet or exceed the State standards.

Alaska National Interest Lands Conservation Act (ANILCA)
Passed by Congress in 1980, this legislation designated 14 National Forest Wilderness areas in Southeast Alaska. The Alaska National Interest Lands Conservation Act of December 2, 1980, Public Law 96-487, 96th Congress, 94 Stat. 2371-2551, Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

Alaska Native Claims Settlement Act (ANCSA)
Public Law 92-203, 92nd Congress, 85 Stat. 2371-2551. Approved December 18, 1971, Native Claims Settlement Act (ANCSA) ANCSA provides for the settlement of certain land claims of Alaska Natives and for other purposes.

Alluvial Fan
A cone-shaped deposit of organic and mineral material deposited where a stream runs out onto a level plain or meets a slower stream.

Alternative
One of several policies, plans, or projects proposed for decision making.

Anadromous Fish
Anadromous fish (such as salmon, steelhead, and sea-run cutthroat trout) spend part of their lives in freshwater and part of their lives in saltwater. Individuals are born in freshwater but migrate to and feed in the sea before returning to freshwater to breed.

Background
The distant part of a landscape where detail is not seen. The seen or viewed area located from 3 or 5 miles to infinity from the viewer. (See "Foreground" and "Middleground".)

Beach Fringe
The beach fringe is an area of approximately 1,000 feet inland from mean high tide on all marine coastlines. Programmed timber harvest is not allowed; and when possible roads are located outside the fringe.

Best Management Practice (BMP)
Practices used for the protection of water quality. BMPs are designed to prevent or reduce the amount of pollution from nonpoint sources or other adverse water quality impacts while meeting other goals and objectives. BMPs are standards to be achieved, not detailed or site- specific prescriptions or solutions. BMPs as defined in the USDA Forest Service Soil & Water Conservation Handbook are mandated for use in Region 10 under the Tongass Timber Reform Act.

Biogeographic Province
Twenty-one ecological subdivisions of Southeast Alaska that are identified by generally distinct ecological, physiographic, 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.

Biological Diversity (Biodiversity)
The variety of life in all its forms and at all levels. This includes the various kinds and combinations of: genes; species of plants, animals, and microorganisms; populations; communities; and ecosystems. It also includes the physical and ecological processes that allow all levels to interact and survive. The most familiar level of biological diversity is the species level, which is the number and abundance of plants, animals, and microorganisms. In the context of the Forest Plan, the variety of life forms and processes…within the area covered by a land management plan.

Blowdown
See windthrow.

Board Foot (BF)
A unit of wood 12" X 12" X 1". One acre of commercial timber in Southeast Alaska on the average yields 28,000-34,000 board feet per acre (ranging from 8,000-90,000 board feet per acre). One million board feet (MMBF) would be the volume of wood covering 1 acre 2 feet thick. One million board feet yields approximately enough timber to build 120 houses or 75,555 pounds of dissolving pulp.

Buffer
An area around a resource where timber harvest is restricted or prohibited. For example, the Tongass Timber Reform Act (TTRA) requires that timber harvest be prohibited in an area no less than 100 feet on each side of all Class I streams and Class II streams which flow directly into Class I streams. This 100-foot area is known as a "stream buffer".

Cairn
A rock pile, usually used as a marker, burial, or blind.

Clearcut
A regeneration or harvesting method that removes essentially all trees in a stand. . The area harvested may be a patch, strip, or stand large enough to be mapped or recorded as a separate class in planning for sustained yield. Clearcut size on the Tongass National Forest is limited to 100 acres.

Coastal Zone Management Act (CZMA)
Under the Coastal Zone Management Act of 1972, as amended, Forest Service activities and development projects that affect the coastal zone must be consistent to the maximum extent practicable with the enforceable policies of the Alaska Coastal Management Program (ACMP). Such “consistency determinations” are made by the Forest Service, and are reviewed by the State of Alaska, as required by the CZMA.

Code of Federal Regulations (CFR)
A codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government.

Commercial Forest Land (CFL)
Productive forest land that is producing or capable of producing crops of industrial wood and is not withdrawn from timber utilization by statute or administrative regulation. This includes areas suitable for management and generally capable of producing in excess of 20 cubic feet per acre of annual growth or in excess of 8,000 board feet net volume per acre. It includes accessible and inaccessible areas.

Normal CFL: Timber that can be economically harvested with locally available logging systems. Composed of two categories:

Standard: Timber that can be economically harvested with locally available logging systems, such as highlead or short-span skyline.

Special: Timber that is in areas where special consideration is needed to protect other resources but can be harvested with locally available logging systems.

Non-standard CFL: Timber that cannot be harvested with locally available logging systems and would require the use of other logging systems such as helicopter or long-span skyline.

Commercial Thinning
Any type of thinning that produces merchantable material at least equal to the value of the direct costs of harvesting.

Connectivity
A measure of the extent that forest areas between or outside reserves provide habitat for breeding, feeding, dispersal, and movement.

Corridor
Connective links of certain types of vegetation between patches of suitable habitat which are necessary for certain species to facilitate movement of individuals between patches of suitable habitat. Also refers to transportation or utility rights-of-way.

Cover
Refers to trees, shrubs, or other landscape features that allow an animal to partly or fully conceal itself.

Critical Habitat
Specific terrain within the geographical area occupied by threatened or endangered species. Physical and biological features that are essential to conservation of the species and which may require special management considerations or protection are found in these areas.

Crown
The upper part of a tree or woody plant that carries the main branch system and foliage. Collectively, tree crowns form the stand canopy.

Cruise
Refers to the general activity of determining timber volumes and quality as opposed to a specific method.

Cultural Resources
Historic or prehistoric objects, sites, buildings, structures, and their remains, resulting from past human activities. Also called heritage resources.

Cumulative Effects
The impacts on the environment resulting from additional 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.

Deer Winter Range (Deer Winter Habitat)
Locations that provide food and shelter for Sitka black-tail deer under moderately severe to severe winter conditions. Usually associated with high-volume old-growth stands at low elevation and with south aspects.

Diameter Breast Height (DBH)
The diameter of a tree at breast height; breast height is measured at 4.5 feet from ground level.

Direct Employment
The jobs that are immediately associated with the timber sale, including, for example, logging, sawmills, and pulp mills.

Diversity
The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

Draft Environmental Impact Statement (Draft EIS)
A statement of environmental effects for a major Federal action which is released to the public and other agencies for comment and review prior to a final management decision. Required by Section 102 of the National Environmental Policy Act (NEPA).

Eagle Nest Tree Buffer Zone
A 330-foot radius around eagle nest trees established in an agreement between the U.S. Fish and Wildlife Service and the Forest Service.

Ecosystem
A community of organisms and its physical setting. An ecosystem, whether a fallen log or an entire watershed, includes resident organisms, non-living components such as soil nutrients, inputs such as rainfall, and outputs such as organisms that disperse to other ecosystems.

Effects
Effects, impacts, and consequences as used in this environmental impact statement are synonymous. Effects may be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, or social, and may be direct, indirect, or cumulative.

Direct Effects: Results of an action occurring when and where the action takes place.

Indirect Effects: Results of an action occurring at a location other than where the action takes place and/or later in time, but in the reasonably foreseeable future.

Cumulative Effects: See Cumulative Effects.

Endangered Species
Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as Endangered in accordance with the 1973 Endangered Species Act. See also Threatened Species, Sensitive Species.

Erosion
The wearing away of the land surface by running water, wind, ice, gravity, or other geological activities.

Estuary
For the purpose of this EIS process, estuary refers to the relatively flat, intertidal, and upland areas generally found at the heads of bays and mouths of streams. They are predominately mud and grass flats and are unforested except for scattered spruce or cottonwood.

Even-aged Management
A planned sequence of treatments designed to regenerate and maintain one distinct age class. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of that age of the stand at harvest rotation age. Clearcut, Clearcutting with reserves, shelterwood, or seed tree cutting methods produce even-aged stands.

Executive Order
An order or regulation issued by the President or some administrative authority under his or her direction.

Final Environmental Impact Statement (Final EIS)
The final version of the statement of environmental effects required for major Federal actions under Section 102 of the National Environmental Policy Act. It is a revision of the draft environmental impact statement (Draft EIS) to include public and agency responses to the draft. The decision maker chooses which alternative to select from the Final EIS, and subsequently issues a Record of Decision (ROD).

Floodplain
That portion of a river valley, adjacent to the river channel, which is covered with water when the river overflows its banks at flood stages.

Foreground (Foreground Distance Zone)
The stand of trees immediately adjacent to a scenic area, recreation facility, or forest highway; area located less than 1/4 mile from the viewer. See also Background and Middleground.

Forest or Forest Land
National Forest System lands currently supporting or capable of supporting forests at a density of 10 percent crown closure or better. Includes all areas with forest cover, including old growth and second growth, and both commercial and non-commercial forest land.

Forest Land Classification
Forested land is classified under each of the land management alternatives according to how it relates to be management of the timber resource. The following are definitions of timber classifications used for this purpose.

Nonforest: Land that has never supported forests and land formerly forested where use for timber production is precluded by development or other uses.

Forest: Land at least 10 percent stocked (based on crown cover) by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.

Suitable or suitable available: Land to be managed for timber production on a regulated basis.

Unsuitable: Forest land withdrawn from timber utilization by statute or administrative regulation (for example, wilderness), or identified as inappropriate for timber production in the Forest planning process.

Commercial forest: Forest land tentatively suitable for the production of continuous crops of timber and that has not been withdrawn.

Forested Wetland
A wetland whose vegetation is characterized by an overstory of trees that are 20 feet or taller.

Forest Plan
The Tongass Land and Resource Management Plan as amended, signed January 23, 2008. This is the land allocation and management plan for the Tongass National Forest that directs and coordinates planning, the daily uses, and the activities carried out within the forest.

Fragmentation
An element of biological diversity that describes the natural condition of habitats in terms of the size of discrete habitat blocks or patches, their distribution, the extent to which they are interconnected, and the effects of management on these natural conditions. Also the process of reducing the size and connectivity of stands within a Forest.

FSH
Forest Service Handbook.

FSM
Forest Service Manual.

Game Management Units (GMU)
GMUs are geographical areas defined by the Alaska Department of Fish and Game to manage wildlife populations.

Geographic Information System (GIS)
An information processing technology to input, store, manipulate, analyze, and display spatial and attribute data to support the decision-making process. It is a system of computer maps with corresponding site-specific information that can be electronically combined to provide reports and maps.

Groundwater
Groundwater is water within the earth that supplies wells and springs.

Guideline
A preferred or advisable course of action or level of attainment designed to promote achievement of goals and objectives. The Forest Plan displays “Standards and Guidelines” in Chapter 4.

Habitat
The sum total of environmental conditions of a specific place occupied by an organism, population, or community of plants and animals.

Habitat Capability
The number of healthy animals that a habitat can sustain. Used in wildlife models to calculate rough population estimates for management indicator species.

Habitat Suitability Index (HSI)
This is a value assigned to a unit of land using a computerized model that related vegetative and geographic characteristic (e.g. stand volume, proximity to a stream or cliff, slope, aspect, etc.) to the land unit's value for a particular wildlife species. Values generally range from 0 to 1, with 1 being the best. The Habitat Capability Models used to generate HSIs were developed by interagency teams of biologists using the best available information including research results and best professional judgment.

Heritage Resources
Historic or prehistoric objects, archaeological sites, buildings, structures, and their remains, resulting from past human activities.

Historic Property
Any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion on the National Register, including artifacts, records, and material remains related to such a property or resource.

Indirect Employment
The jobs in service industries that are associated with the timber sale including, for example, suppliers of logging and milling equipment.

Interdisciplinary Team (IDT)
A group of people with different backgrounds assembled to research, analyze, and write a project environmental analysis (environmental impact statement or environmental assessment). The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to adequately analyze a proposed action and its alternatives.

Issue
A point, matter, or section of public discussion or interest to be addressed or decided.

Karst and Cave
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 Southeast Alaska, limestone and marble. The dissolution of the rock results in the development of internal drainage, producing sinking streams, closed depressions, and other landforms such as sinkholes, collapse channels, and caves.

Land Use Designation
A defined area of land to which specific management direction is applied, as specified in the 1997 Forest Plan.

Landslides
The moderately rapid to rapid downslope movement of soil and rock materials that may or may not be water-saturated.

Large Woody Debris
Any large piece of relatively stable woody material having a diameter of at least 4 inches and a length greater than 3 feet that intrudes into the stream channel. Also called Large Organic Debris (LOD).

Log Transfer Facility (LTF)
An LTF is a facility that is used for transferring commercially-harvested logs to and from a vessel or log raft, or the formation of a log raft. It is wholly or partially constructed in waters of the United States and location and construction are regulated by the 1987 Amendments to the Clean Water Act. Also called marine access facility.

Logging Systems
Long-span cable: Single-span cable yarding system with a long corner exceeding 1,000 feet, horizontal distance. Typically, this includes a variety of live skyline systems, including standing skylines and running skylines where reach is long.

Short-span cable: All cable systems with a longer corner of not more than 1,000 feet, horizontal distance. Typically, this includes running skyline with a carriage and chokers, running skyline with grapple, live skyline with gravity return, and highlead.

Running skyline: A yarding system with three suspended moving lines, generally referred to as the main, haul-back, and slack-pulling, that when properly tensioned will provide lift, travel, and control to the carriage; normally indicates a gantry type tower and a three-drum yarder.

Shovel: The process of forwarding logs from stump to landing by repeated swinging of logs by a hydraulic excavator-based log loader.

Helicopter: Flight path cannot exceed 40 percent downhill or 30 percent uphill; landings must be selected so there is adequate room for the operation and so that the helicopter can make an upwind approach to the drop zone.

Marine Access Facility (MAF)
A facility that is used for transferring commercially harvested logs to and from a vessel or log raft, or the formation of a log raft. It is wholly or partially constructed in waters of the United States and location and construction are regulated by the 1987 Amendments to the Clean Water Act. Also called "log transfer facility", "terminal transfer facility" or "log dump".

MBF
A thousand board feet net sawlog and utility volume.

MMBF
A million board feet net sawlog and utility volume.

Management Indicator Species (MIS)
Species selected in at the Forest-level planning process, in accordance with NFMA (1982) that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.

Management Prescriptions
Management practices and intensity selected and scheduled for application on a specific area (e.g., a land use designation) to attain multiple-use and other goals and objectives.

Mass Movement
The downslope movement of a block or mass of soil. This usually occurs under conditions of high soil moisture and does not include individual soil particles displaced as surface erosion.

Memorandum of Understanding (MOU)
A legal agreement between the Forest Service and others agencies resulting from consultation between agencies that states specific measures the agencies will follow to accomplish a project. A memorandum of understanding is not a fund-obligating document.

Middleground (Middleground Distance Zone)
The visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly for the landscape; area located from 1/4 to 5 miles from the viewer. See also Foreground and Background.

Mineral Soils
Soils consisting predominately of, and having its properties determined by, mineral material.

Mitigation
Measures designed to counteract environmental impacts or to make impacts less severe. These 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.

Mixed Conifer
In Southeast Alaska, mixed conifer stands usually consist of western hemlock, mountain hemlock, Alaska yellow-cedar, Western redcedar, and Sitka spruce species. Shore pine may occasionally be present depending on individual sites.

Model
A representation of reality used to describe, analyze, or understand a particular concept. A model may be a relatively simple qualitative description of a system or organization, or a highly abstract set of mathematical equations. A model has limits to its effectiveness, and is used as one of several tools to analyze a problem.

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 manner called for, to determine whether the mitigation measures were effective, or to validate whether overall goals and objectives were appropriate. Different levels call for different methods of monitoring.

Multiple Use
The management of all the various renewable surface resources of the National Forest System so that they are utilized in the combination that will best meet the needs of the American people. The Forest Service is making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions. Some lands will be used for less than all of the resources. The Forest Service strives for a harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output (36 CFR 219).

Muskeg
In Southeast Alaska, a type of bog that has developed over thousands of years in depressions or flat areas on gentle to steep slopes (also called peatlands).

National Environmental Policy Act (NEPA) of 1969
An Act to declare a national policy which will encourage productive and enjoyable harmony between humankind and the environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, to enrich the understanding of the ecological systems and natural resources important to the Nation, and to establish a Council on Environmental Quality (The Principal Laws Relating to Forest Service Activities, Agricultural Handbook 453. USDA Forest Service, 359 pp.).

National Forest Management Act (NFMA)
A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act requiring the preparation of Regional Guides and Forest Plans and the preparation of regulations to guide that development. (Note – the direction for Regional Guides was rescinded in 2002.)

Net Sawlog Volume
This is tree or log volume suitable in size and quality to be processed into lumber. In Southeast Alaska, depending on the market, the volume may be processed as pulp or lumber.

No-action Alternative
The most likely condition expected to exist in the future if current management direction were to continue unchanged.

Notice of Intent (NOI)
A notice printed in the Federal Register announcing that an Environmental Impact Statement will be prepared. The NOI must describe the proposed action and possible alternatives, describe the agency's proposed scoping process, and provide a contact person for further information.

Offering
A Forest Service specification of timber harvest units, subdivisions, roads, and other facilities and operations to meet the requirements of a contract.

Off-highway Vehicle (OHV)
Any motor vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain.

Old Growth
Ecosystems distinguished by old trees and related structural attributes. Old growth encompasses the later stages of forest stand development that typically differ from earlier stages in a variety of characteristics which may include larger tree size, higher composition, and different ecosystem function. The structure and function of an old-growth ecosystem will be influenced by its stand size and landscape position and context.

Organic Soils
Soils that contain a high percentage (generally greater than 20 to 30 percent) of organic matter throughout the soil depth.

Partial Cut
The removal of only part of the stand where any number of live stems are left standing in any of various spatial patterns for the purposes other than regnerating a new age class.

Patch
A non-linear surface area differing in appearance from its surroundings.

Payments to States
A fund consisting of approximately 25 percent of the gross annual timber receipts received by the National Forests in that State. This is returned to the State for use on roads and schools.

Planning Area
The planning area is the portion of the National Forest System usually a National Forest.

Planning Record
A record of decisions and activities that result from the process of developing a forest plan, revision, or significant amendment or environmental analysis for a planning area, usually a National Forest.

Plant Communities
Aggregations of living plants having mutual relationships among themselves and to their environment. More than one individual plant community.

Population Viability
Ability of a population to sustain itself.

Process Group
A combination of similar channel types based on major differences in landform, gradient, and channel shapes.

Productive Old Growth (POG)
Old-growth forest capable of producing at least 20 cubic feet of wood fiber per acre per year, or having greater than 8,000 board feet per acre.

Public Participation
Meetings, conferences, seminars, workshops, tours, written comments, responses to scoping letters or questionnaires, and similar activities designed and held to obtain comments from the public about Forest Service activities.

Record of Decision
A document separate from but associated with an Environmental Impact Statement which states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and if not, why not.

Recreation Opportunity Spectrum (ROS)
ROS is a system for planning and managing recreation resources that categorize recreation opportunities into seven classes [(from most natural to least natural): Primitive (P); Semi-Primitive Non-motorized (SPNM); Semi-Primitive Motorized (SPM); Roaded Natural (RN); Roaded Modified (RM); Rural (R); and Urban (U)]. 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, types of facilities provided, the degree of outdoor skills needed to enjoy the area, and the relative density of recreation use. In timber planning projects, roads tend to have the most influence in changing the setting from a natural setting, to a developed one. Harvest units can have an effect as well, depending on the prescription used.

Regeneration
The process of establishing a new crop of trees on previously harvested land either naturally or artificially.

Regional Forester
The Forest Service official responsible for administering a single region.

Resident Fish
Fish that are not anadromous and that reside in freshwater on a permanent basis. Resident fish include non-anadromous Dolly Varden char and cutthroat trout.

Responsible Official
The Forest Service employee who has the delegated authority to make a specific decision.

Riparian Area
Area with distinctive resource values and characteristics that contain elements of aquatic and riparian ecosystems, which can be geographically delineated.

Road
A motor vehicle route over 50 inches wide, unless identified and managed as a trail.

Forest road or trail: A road or trail wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.

National Forest System road: A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority.

Temporary road or trail: A road or trail necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or trail and that is not included in a forest transportation atlas.

Travel management atlas: An atlas that consists of a forest transportation atlas and a motor vehicle use map or maps.

Unauthorized road or trail: A road or trail that is not a forest road or trail or a temporary road or trail and that is not included in a forest transportation atlas.

Road Construction
Supervising, inspecting, actual building, and incurrence of all costs incidental to the construction of a road.

Road Decommissioning
Activities that result in the stabilization and restoration of unneeded roads to a more natural state.

Road Maintenance
Superficial periodic repairs to an existing road surface, brushing, or drainage features; performed to keep those roads in a safe and useful condition for which they were designed.

Road Reconditioning
Heavier maintenance of an existing road such as culvert replacement, surface rock replacement, and subgrade repair.

Road Storage
Storage is a term used only for National Forest System roads. The physical on-the-ground changes are similar to a decommissioned road; however, roads in storage are considered part of the long-term forest road transportation system and may be opened to vehicular traffic in the future. The process/action of storage involves closing a road to vehicle traffic and placing it in a condition that requires minimum maintenance to protect the environment and preserve the facility. Drainage structures in live drains are completely removed to restore natural drainage patterns. Ditch relief culverts may be left in place and supplemented with deep water bars to minimize the cost of reusing the roads in the future.

Roadless Area
An area of undeveloped public land within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.

Rotation
The period between regeneration establishment and final cutting which may be based on many criteria including mean size, age, culmination of mean annual increment and attainment of particular minimum physical or value growth rate, and biological condition. .

Rotation Age
The age of a stand when harvested at the end of a rotation. On the Tongass, the age is generally between 100 and 200 years.

Sawlog
That portion of a tree that is suitable in size and quality for the production of dimension lumber collectively known as sawtimber.

Scenic Integrity Objectives (SIO)
Formerly known as Visual Quality Objectives in the 1997 Forest Plan. Measurable standards reflecting four different degrees of landscape alteration based upon a landscape's diversity of natural features and the public's concern for high scenic quality. The four categories of SIOs are:

High: Management activities are designed to not be visually evident to the casual forest visitor.

Moderate: Management activities are designed to be visually subordinate to the landscape character of the area.

Low: Management activities may visually dominate the characteristics landscape, but must borrow from the naturally established form, line, color, and texture of the surrounding area. The visual characteristics will resemble natural occurrences within the surrounding area, when viewed in the middleground distance.

Very Low: Management activities may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

Scenic Viewshed (SV)
The desired condition emphasizes a natural-appearing landscape as viewed by users of visual priority travel routes and use areas. Recreation and tourism opportunities in a range of settings are available. A variety of successional stages providing wildlife habitat occur, although late successional stages predominate.

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 considered in an EA or an EIS.

Scrub-Shrub Wetland
Wetlands dominated by woody vegetation less than 20 feet tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. In Southeast Alaska this includes forested lands where trees are stunted because of poor soil drainage.

Second Growth
Forest growth that has become established following some disturbance such as cutting, serious fire, or insect attack; even-aged stands that will grow back on a site after removal of the previous timber stand.

Sediment
Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface.

Selection Harvest
The annual or periodic removal of trees (particularly the mature), individually or in small groups from an uneven-aged forest to achieve the balance among diameter classes needed for sustained yields, and in order to realize the yield, and establish a new crop of irregular constitution. Note: The improvement of the forest is a primary consideration.

Sensitive Species
Plant and animal species identified or recognized by the Regional Forester as potentially susceptible or vulnerable to activity impacts or habitat alterations, and therefore in need of special consideration during land management activity planning.

Silviculture
The science of controlling the establishment, composition, growth, health and quality of forests to meet the diverse needs and values of landowners and society on a sustainable basis.

Snag
A standing dead tree, usually greater than 5 feet tall and 6 inches in diameter at breast height.

Soil Productivity
The capacity of a soil, in its normal environment, to produce a specific plant or sequence of plants under a specific system of management.

Spawning Area
The available area in a stream course which is suitable for the deposition and incubation of salmon or trout eggs.

Stand (Tree Stand)
An aggregation 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.

Standard
A course of action or level of attainment required by the 1997 Forest Plan to promote achievement of goals and objectives. The Forest Plan displays “Standards and Guidelines.”

State Historic Preservation Officer (SHPO)
State-appointed official who administers Federal and State programs for cultural resources.

Stocking
The degree of occupancy of land by trees as measured by basal area or number of trees and as compared to a stocking standard; that is, the basal area or number of trees required to fully use the growth potential of the land.

Storm Proofing
Construction of drivable water-bars, ditch blocks, rolling dips or outsloped road prism to channel flows from streams or ditches in the event the drainage structures are blocked by a storm event. The above structures are placed so that when a culvert or ditch is blocked the water will be channeled over the road to reduce the chronic and catastrophic sediment load that would result from the entire road prism being washed away in the case of blocked culvert or ditch.

Stream Class

A mapping unit that displays an identified value for aquatic resources. It is a mechanism for carrying out aquatic resource management policy. Also known as Aquatic Habitat Management Unit (AMHU).

Class I: Streams and lakes with anadromous or adfluvial fish or fish habitat; high quality resident fish waters, or habitat above fish migration barriers known to provide reasonable enhancement opportunities for anadromous fish.

Class II: Streams and lakes with resident fish or fish habitat and generally steep (6 to 25 percent or higher) gradients 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 or fish habitat, but which have sufficient flow or transport sufficient sediment and debris to directly influence downstream water quality or fish habitat capability. These streams generally have bankfull widths greater than 5 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 directly influence downstream water quality or fish habitat capability. These streams generally are shallowly incised into the surrounding hillslope. These streams have a bankfull width of at least 1 foot.

Non-streams: Rills and other watercourses, generally intermittent and less than 1 foot in bankfull width, little or no incisement into the surrounding hillslope, and with little or no evidence of scour.

Structural Diversity

The diversity of forest structure, both vertically and horizontally, which provides for a variety of forest habitats such as logs and multi-layered forest canopy for plants and animals.

Stumpage

The value of timber as it stands uncut in terms of dollar value per thousand board feet.

Subsistence

Section 803 of the Alaska National Interest Lands Conservation Act defines subsistence use as, "the customary and traditional uses by rural Alaska residents of wild renewable resources for direct, personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible by-products of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade."

Subsistence Use Area

Important subsistence use areas include the "most reliable" and "most often hunted" categories from the Tongass Resource Use Cooperative Survey (TRUCS) and from subsistence survey data from ADF&G, the University of Alaska, and the Forest Service, Region 10. Important use areas include both intensive and extensive use areas for subsistence harvest of deer, furbearers, and salmon.

Substrate

The type of material in the bed (bottom) of rivers and streams.

Succession

The ecological progression of community change over time, characterized by displacements of species leading towards a stable climax community.

Suitable
Commercial forest land identified as having both the biological capability and availability to produce industrial wood products.

Suitable Forest Land
Forest land for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions, and for which there is reasonable assurance that such lands can be adequately restocked, and for which there is management direction that indicated that timber production is an appropriate use of that area.

Thinning
The practice of removing some of the trees in a stand so that the remaining trees will grow faster due to reduced competition for nutrients, water, and sunlight. Thinning may also be done to change the characteristics of a stand, improve wildlife habitat or for other purposes. Thinning may be either precommercial or commercial.

Threatened Species
Plant or animal species which is likely to become endangered throughout all or a significant portion of its range within the foreseeable future, as defined in the Endangered Species Act of 1973, and which has been designated in the Federal Register by the Secretary of the Interior as a Threatened Species. See also Endangered Species, Sensitive Species.

Threshold
The point or level of activity beyond which an undesirable set of responses begins to take place within a given resource system.

Tiering
Tiering eliminates repetitive discussions of the same issue by incorporating by reference. The general discussion in an environmental impact statement of broader scope; e.g., this document is tiered to the Tongass Land and Resource Management Plan, as amended.

Timber Appraisal
Establishing the fair market value of timber by taking the selling value minus manufacturing costs, the cost of getting logs from the stump to the manufacturer, and an allowance for profit and risk.

Timber Classification
Forested land is classified under each of the land management alternatives according to how it relates to be management of the timber resource. The following are definitions of timber classifications used for this purpose.

- Commercial Forest: Forest land tentatively suitable for the production of continuous crops of timber and that has not been withdrawn.
- Nonforest: Land that has never supported forests and land formerly forested where use for timber production is precluded by development or other uses.
- Forest: National Forest System lands currently supporting or capable of supporting forests at a density of 10% crown closure or better. Includes all areas with forest cover, including old-growth and second growth, and both commercial and non-commercial forest land.
- Suitable or Suitable Available: Forest land for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions; and for which there is reasonable assurance that such lands can be adequately

restocked; and for which there is management direction that indicated that timber production is an appropriate use of that area. Land to be managed for timber production on a regulated basis.

- Unsuitable: Forest land withdrawn from timber utilization by statute or administrative regulation (for example, wilderness), or identified as inappropriate for timber production in the Forest planning process.

Timber Harvest Unit
A "Timber Harvest Unit" is a portion of a timber sale within which Forest Service specifies for harvest all or part of the timber to meet the requirements of a timber sale contract.

Tongass Land and Resource Management Plan (Forest Plan)
The 10-year land allocation plan for the Tongass National Forest that directs and coordinates planning, the daily uses, and the activities carried out within the forest.

Trail
A route 50 inches or less in width or a route over 50 inches wide that is identified and managed as a trail.

Two-aged Management
A silvicultural method in which the majority of the trees in a harvest unit are cut in one entry, and the rest are left as residual trees, either singly or in patches. The residual trees remain unharvested to provide structural diversity and older-aged trees within the second-growth stand.

Unauthorized Road
For this project, this means a temporary road that received NEPA clearance (a decision was made to create and then close a temporary road through a previous project) that may or may not have been closed with water bars or closed by other means after that project was finished - it is unauthorized to drive on this road at the present time.

Understory
The trees and shrubs in a forest growing under the canopy or overstory.

Uneven-aged Management
Forest management techniques which simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes.

Unsuitable
Forest land withdrawn from timber utilization by statute or administrative regulation; for example, Wilderness, or identified as not appropriate for timber production in the forest planning process.

Value Comparison Unit (VCU)
Areas which generally encompass a drainage basin containing one or more large stream systems; boundaries usually follow easily recognizable watershed divides. Established to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

Variety Class
These classes describe the landscape’s inherent or natural scenic quality, based on the degree of variety of landform, vegetative patterns, and water features.

Viable Population
For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area (the National Forest).

Viewshed
An expansive landscape or panoramic vista seen from a road, marine waterway, or specific viewpoint.

V-Notches
A deeply incised valley along some waterways that would look like a "V" from a cross-section. These abrupt changes in terrain features are often used as harvest unit or yarding boundaries.

Volume
Stand volume based on standing net board feet per acre by Scribner Rule.

Volume Strata
Categories of timber volume derived from the timber type data layer (TIMTYP) and the common land unit data layer (CLU). Three volume strata (low, medium, and high) are recognized in the Forest Plan.

Low Strata: The lowest range of volume for commercial forest land based on per acre volume estimates. The Forest Plan estimated the low volume class strata to contain approximately 13.9 MBF/Acre.

Medium Strata: The middle range of volume for commercial forest land based on per acre volume estimates. The Forest Plan estimated the medium volume class strata to contain approximately 23.3 MBF/Acre.

High Strata: The high range of volume for commercial forest land based on per acre volume estimates. The Forest Plan estimated the high volume class strata to contain approximately 29.9 MBF/Acre.

Watershed
The area that contributes water to a drainage or stream. Portion of the forest in which all surface water drains to a common point. Watersheds can range from a few tens of acres that drain a single small intermittent stream to many thousands of acres for a stream that drains hundreds of connected intermittent and perennial streams.

Wetland
Areas that are inundated by surface or groundwater frequently enough to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include: swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mudflats, and natural ponds. See the 1997 Forest Plan pp. 3-318 and 3-321 for detailed discussion on wetland type definitions.

Wilderness
Areas designated by congressional action 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, which generally appear to have been affected primarily by the forces of nature, with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or a primitive and unconfined type of recreation; areas of at least 5,000 acres are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest. In Alaska, Wilderness has been designated by ANILCA and the Tongass Timber Reform Act (TTRA).

Wildlife Analysis Area (WAA)
A division of land used by the Alaska Department of Fish and Game, and susequently the USDA Forest Service, for wildlife analysis.

Wildlife Habitat
The locality where a species may be found and where the essentials for its development and sustained existence are obtained.

Windfirm
Trees that have been exposed to the wind throughout their life and have developed a strong root system or trees that are protected from the wind by terrain features.

Windthrow
The act of trees being uprooted by the wind. In Southeast Alaska, Sitka spruce and hemlock trees are shallow rooted and susceptible to windthrow. There generally are three types of windthrow:

Endemic: where individual trees are blown over;

Catastrophic: where a major windstorm can destroy hundreds of acres; and

Management Related: where the clearing of trees in an area make the adjacent standing trees vulnerable to windthrow.

Yarding
The process of conveying logs from the stump to a collection point; this can be done with a shovel, cable, or helicopter system.

4 Lists

Literature Cited

Alaback, Paul B. 1982. Dynamics of Understory Biomass in Sitka Spruce Western Hemlock Forests of Southeast Alaska. Department of Forest Science, School of Forestry, Oregon State University, Corvallis, Oregon.

Alaska Department of Environmental Conservation. 2007. Alaska's Nonpoint Source Pollution Control Strategy, revised February 17, 2007. Retrieved from http://dec.state.ak.us./water/wnpspc/fdfs/woor_NPSStrategy.pdf on May 8, 2007.

Alaska Department of Fish and Game. 1996. 1995 Deer Hunter Survey Summary Statistics: Southeast Alaska August 1995-January 1996 Hunting Season. Alaska Department of Fish and Game, Division of Wildlife Conservation. Juneau, Alaska.

Alaska Department of Fish and Game. 1998. 1997 Deer Hunter Survey Summary Statistics: Southeast Alaska August 1997-January 1998 Hunting Season. Alaska Department of Fish and Game, Division of Wildlife Conservation. Juneau, Alaska.

Alaska Department of Fish and Game. 2003. 2002 Deer Hunter Survey Summary Statistics: Southeast Alaska August 2002-January 2003 Hunting Season. Alaska Department of Fish and Game, Division of Wildlife Conservation. Juneau, Alaska.

Alaska Department of Fish and Game. 2004. Furbearer Management Report of Survey-Inventory Activities 1 July 2000 – 30 June 2003. Cathy Brown, editor. Juneau, Alaska.

Alaska Department of Fish and Game. 2005. Deer Management Report of survey-inventory activities July 1, 2002 – June 30, 2004.

Alaska Department of Fish and Game. 2005. Harvest Data for WAA 510. Unpublished. Ketchikan, Alaska.

Alaska Department of Fish and Game. 2008. Comment letter on Navy Timber Sale DEIS. On record at Wrangell Ranger District, Wrangell, AK.

Alaska Department of Labor. http://almis.labor.state.ak.us

Alaska Natural Heritage Program. 2007. Rare Vascular Plant Tracking List for Alaska, April 2007. http://aknhp.uaa.alaska.edu/botany/pdfs/RPWG07_alpha.pdf

ANHP-Alaska Natural Heritage Program. 2007a. Invasive Plant Ranking Results Retrieved December 26, 2007, from (http://akweeds.uaa.alaska.edu/akweeds_ranking_page.htm).

Alaska National Interest Lands Conservation Act (ANILCA; P.L. 96-487, 1980)

Allred, Kevin. 2006. Personal communication with Jackie deMontigny, Wrangell, AK.

Bosch, J.M., Hewlett, J.D. 1982. A review of catchment experiments to determine the effect of vegetation changes on water yield and evapotranspiration. Journal of Hydrology, 55.

Brackley, Allen M.; Rojas, Thomas D.; Haynes, Richard W. 2006. Timber Products Output and Timber Harvests in Alaska: Projections for 2005-25. USDA Forest Service. Pacific Northwest Research Station. General Technical Report, PNW-GTR-677. July 2006.

Council on Environmental Quality (CEQ), Executive Office of the President, 1997. Environmental Justice Guidance under the National Environmental Policy Act.

Code of Federal Regulations (CFR). Title 33—Navigation and Navigable Waters
33 CFR 323.4(a) (6). (Discharges not Requiring Permits)

Code of Federal Regulations (CFR). Title 36--Parks, Forests, and Public Property
36 CFR 800 (Protection of Historic Properties)
36 CFR 212 (Travel Management)
36 CFR 219 (Planning)

Code of Federal Regulations (CFR). Title 36—Protection of Environment
40 CFR 230.41 (a) (1). (Potential Impacts on Special Aquatic Sites)

Cohen, Kathryn A. 1989. Wrangell Harvest Study: A Comprehensive Study of Wild resource Harvest and use by Wrangell Residents. Technical Paper No. 165. Alaska Dept Fish Game, Division of Subsistence Juneau, AK.

Cole, Forrest. 2005a. Project Level Environmental Analysis letter. USDA Forest Service, Region 10, Tongass National Forest. Ketchikan, Alaska.

Deal, Robert L. 2001. The effects of partial cutting on forest plant communities of western hemlock - Sitka spruce stands in southeast Alaska. Canadian Journal of Forestry Resources. 31:2067-2079.

Deal, Robert L., John C. Tappenheimer and Paul E. Hennon. 2002. Developing silvicultural systems based on partial cutting in western hemlock-Sitka spruce stands of southeast Alaska. Institute of Chartered Foresters, Forestry, Vol. 75, No. 4: 425-431.

DeGayner, Gene; Hanley, Tom; Leslie, Chip; Kie, John G. 1995. Biology of the deer and how it relates to habitat. Objective to develop a Habitat model. November 7, 1995.

DeLapp, J. 1992. Rare Vascular Plant Species of the USDA Forest Service, Alaska Region. Alaska Natural Heritage Program, Anchorage, AK.

Esposito, G. S. and Smith, J.L. 2007. Cultural Resource Investigations in the Navy Timber Sale Area, Etolin Island, Alaska. Project No. R2004100522005. Manuscript on file. USDA Forest Service. Tongass National Forest. Petersburg Ranger District, Petersburg, AK.

Furniss, M.J.; Roelofs, T.D.; Yee, C.S... 1991. Road Construction and Maintenance. Chapter 8 Influences of Forest and Rangeland Management on Salmonids Fishes and Their Habitats. American Fisheries Society Special Publication 1991.

Geier, T.W. 1998. A Proposed Two-Tiered Sediment Risk Assessment for Potential fish Habitat Impacts from Forest Management in Southeast Alaska. USDA Forest Service. Tongass National Forest. January 21, 1998.

Glaser, Paul H. 1998. The Impact of Forestry Roads on Peatlands within the Tongass National Forest, Southeast Alaska, Unpublished Report, USDA Forest Service, Juneau, AK.

Gomi, T., Moore, R.D., Hassan, M. 2005. Suspended sediment dynamics in small forest streams of the Pacific Northwest. Journal of the American Water Resources Association 41(4).

Gomi, T., R. D. Moore, and A. S. Dhakal. 2006. Headwater stream temperature response to clear-cut harvesting with different riparian treatments, coastal British Columbia, Canada, Water Resources Research 42, W08437, doi:10.1029/2005WR004162.

Hanley, Thomas A. and Rose, Cathy L. 1987. Influence of Overstory on Snow Depth and Density in Hemlock-Spruce Stands: Implications for Management of Deer Habitat in Southeast Alaska. USDA Forest Service. PNW-RN-459.

Harr, R.D. 1986. Effects of clearcutting on rain-on-snow runoff in Western Oregon: a new look at old studies. Water Resources Research, Vol. 22, No. 7.

Harris, A.S. 1999. Wind in the Forests of Southeast Alaska and Guides for Reducing Damage. USDA Forest Service. PNW-GTR-244. July 1999.

Harris, Larry D. 1984 The Fragmented Forest: Island Biogeography Theory and the Preservation of Biotic Diversity. The University of Chicago Press.

Hennon, P.E., Shaw, C.G., III. December 1997. What is killing these long-lived, defensive trees? Journal of Forestry, Vol. 95, No.12.

Jones, J.A. 2000. Hydrologic processes and peak discharge response to forest removal, regrowth, and roads in 10 small experimental basins. Water Resources Research 36 (9).

Jones, J.A., Grant, G.E. 1996. Peak Flow Responses to Clear-cutting and Roads in Small and Large Basins, Western Cascades, Oregon. Water Resources Research 32, No. (4).

Julin, Kent R., D'Amore, David V. 2003. Tree Growth on Forested Wetlands of Southeastern Alaska Following Clearcutting. USDA Forest Service. Juneau, Alaska.

Kahklen, K. and Moll, J. 1999. Measuring effects of roads on groundwater: Five case studies: USDA Forest Service Technology and Development Center. 9977-1801-SDTDC. January 1999.

Kilborn, Kenneth A., Parrent, Daniel J., and Housley, Robert D. 2004. Estimating Sawmill Processing Capacity for Tongass Timber. Res. Note PNW-RN-545. Portland, OR. USDA Forest Service. Pacific Northwest Research Station. May 2004.

Kirchhoff, Matthew D. 1991. Status, Biology, and conservation Concerns for the Wolf (Canis lupus ligoni) in Southeast Alaska. Alaska Department of Fish and Game. June 1991.

Kirchhoff, Matthew D. and Douglas N. Larsen. 1998. Dietary Overlap Between Native Sitka Black-tailed Deer and Introduced Elk in Southeast Alaska. Journal of Wildlife Management, Volume 62, Number 1, Pages 236-242.

Kramer, M.G., Hansen, A.J., Tapper, M.L., and Kissinger, E.J. 2001. Abiotic controls on long-term windthrow disturbance and temperate rain forest dynamics in southeast Alaska. Ecology. 82.

Krosse, Patricia, 1993. Draft Preliminary Soil Resource Inventory Report, Stikine Area, Tongass National Forest. USDA Forest Service, Petersburg Alaska. 250 p.

Kruse, J.A., Muth, R.M. 1990. Subsistence use of renewable resources by rural residents of Southeast Alaska. A final report prepared for the USDA Forest Service. Institute of Social and Economic Research, University of Alaska, Anchorage.

Landwehr, D.J. and G. Nowacki. 1999. Statistical review of soil disturbance transect data collected on the Ketchikan Area, Tongass National Forest. White paper, 5pp.

McGee, Katherine E. 2000a. Effects of Forest Roads on Surface and Subsurface Flow in Southeast Alaska, Master of Science Thesis, Oregon State University.

Montgomery, David R. 1994. Road surface drainage, channel initiation, and slope instability. Water Resources Research, Vol. 30, No. 6.

Moore, R. Dan and Wondzell, S.M. 2005. Physical hydrology and the effects of forest harvesting in the Pacific Northwest: A review. Journal of the American Water Resources Association 41(4).

National Marine Fisheries Service (NMFS) queriable database (http://www.fakr.noaa.gov)

Nowacki, G.J., Kramer, M.G. 1998. The effects of wind disturbance on temperate rain forest structure and dynamics of southeast Alaska. Gen. Tech. Rep. PNW-GTR-421. Portland, OR:

Patric, J.H. 1966. Rainfall interception by mature coniferous forests of Southeast Alaska. Journal of Soil and Water Conservation, November-December 1966.

Paustian, Steven J. 1987. Monitoring nonpoint source discharge of sediment from timber harvesting activities in two Southeast Alaska watersheds. In: Water Quality in the great Land, Alaska's Challenge: Proceedings of the Alaska Chapter of the American Water Resources Association. Water Research Center-Institute of Northern Engineering, University of Alaska, Fairbanks, Report IWR-109.

Paustian, S.J. 1992. A channel type user's guide for the Tongass National Forest, Southeast Alaska. USDA Forest Service, Alaska Region. R10-TP-26.

Person, David K., Matthew Kirchhoff, Victor Van Ballenberghe, George C. Iverson, and Edward Grossman. 1996. The Alexander Archipelago Wolf: A Conservation Assessment. USDA Forest Service Pacific Northwest Research Station. General Technical Report PNW-GTR-384. Portland, Oregon.

Person, David, Matthew Kirchhoff, Dr. Victor Van Ballenberghe, and Dr. R. Terry Bowyer. September 19, 1997. Letter to Beth Pendleton commenting on Tongass National Forest Land Management Plan. On File.

Programmatic Agreement. 2002.

Schaberg, P.G., Hennon, P.E., D'Amore, D.V., Hawley, G.J., Borer, C.H. 2005. Seasonal difference in freezing tolerance of yellow-cedar and western hemlock trees at a site affected by yellow-cedar decline, Canadian Journal of Forest Resources. 35.

Schoen, John W. and Kirchhoff, Matthew D. 1985. Seasonal Distribution and Home-Range Patterns of Sitka Black-tailed Deer on Admiralty Island, Southeast Alaska. Journal of Wildlife Management, Volume 49, Issue 1.

Smith, W.P. 2007. Ecology of Glaucomys sabrinus: habitat, demography, and community relations. Pacific Northwest Research Station, Forestry Sciences Laboratory, Juneau, AK. In Journal of Mammalogy, 88(4):862-881, 2007.

Stensvold. 2005a. Personal Communication. 2005b. R10 Sensitive Plant Matrix. Unpublished document on file at the Petersburg Supervisor's Office, Petersburg, AK.

Sullivan, T.P., and C. Cheng. 1989. Impact of Porcupine feeding damage on intensive forest management in the Prince Rupert Forest Region: problem analysis. B.C. Min. For. FRDA # 083. Victoria, BC. 20 pp.

Suring, Lowell H.; Flynn, Rodney W.; DeGayner, Eugene J. 1992. Habitat Capability Model for Marten in Southeast Alaska: Winter Habitat. USDA Forest Service, Alaska Region. Juneau, Alaska.

Swanston Douglas N. 1969. Mass Wasting in coastal Alaska. Pacific Northwest Forest and Range Experiment Station, Juneau Alaska. USDA Forest Service Research Paper PNW-83.

Swanston, D.N. 1994. Slope movement and processes and characteristics. In: Chatwin, S.C; Howes, D.E.; Schwab, J.W.; Swanston, D.N., eds. A guide for management of landslide-prone terrain in the Pacific Northwest. Land Management Handbook 18 Victoria, BC: British Columbia Ministry of Forest; Portland, OR: U.S. Dept of Agriculture, Forest Service, Pacific Northwest Research Station: 1-15.

Swanston, D.N. and Daniel Marion. 1991. Landslide response to timber management in Southeast Alaska. Proceedings of the Fifth Federal Interagency Sedimentation Conference, March 18-21, 1991, Las Vegas, Nevada. Printed by the Federal Energy Regulatory Commission.

Thompson, J.E. 2006. Tier III Stream Surveys, Etolin Island, 2005. Unpublished report on file at Petersburg Supervisors Office. (http://fsweb.stikine.r10.fs.fed.us/tongass/wfew/etolin_tieriii_2005final.doc)

US Army Corps of Engineers 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-878-1. Illus. Appendix. Washington, D.C.

USDA Forest Service. 1976. National Forest Management Act of 1976, Section 6 (g)(3)

USDA, Forest Service. 1977. National Forest Landscape Management. Volume 2: Chapter 4. Roads. Agriculture Handbook No. 483 U.S. Government Printing Office.

USDA Forest Service. 1979. National Forest Landscape Management. Volume 2: Chapters 1, 4 and 5. The Visual Management System. Agriculture Handbook No. 462. U.S. Government Printing Office.

USDA Forest Service. 1979. The Landscape Management Handbook No. FS 2309.22. Chapter 500.

USDA Forest Service. 1979. Alaska Region, Division of Recreation, Soils, and Watersheds. Visual Character Types. Series No. R10-63.

USDA, Forest Service. 1980. National Forest Landscape Management. Volume 2: Chapter 5. Timber. Agriculture Handbook No. 559. U.S. Government Printing Office.

USDA Forest Service. 1992. Region 10 Soil Quality Standards Forest Service Manual 2500 R-10 Supplement No. 2500-92-1.

USDA Forest Service 1992. Forest Service Handbook 7709.58 – Transportation System Maintenance Handbook, WO Amendment 7709.58-92-1.

USDA Forest Service. 1995. Landscape Aesthetics – A Handbook for Scenery Management. Agriculture Handbook No. 701. U.S. Government Printing Office.

USDA Forest Service. 1997. Tongass National Forest Land and Resource Management Plan, Final Environmental Impact Statement, and Record of Decision. R-10-MB-338 (all volumes). USDA Forest Service, Alaska Region.

USDA Forest Service. 2003. Tongass National Forest Land and Resource Management Plan Supplemental Environmental Impact Statement. Juneau, Alaska: USDA Forest Service, Alaska Region, Tongass National Forest. R10-MB-481b. February 2003.

USDA Forest Service. 2003 Forest Service Manual 2300 – Recreation, wilderness, and realted resource management, Chapter 2380 Landscape management (WO Amendment 2300-2003-1, 5/02/2003, USDA Forest Service.

USDA Forest Service 2005. Travel Management Rule.

USDA Forest Service. 2005. Zarembo Roads Analysis.

USDA Forest Service. 2005. Tongass National Forest Annual Monitoring and Evaluation Report for Fiscal Year 2005.

USDA Forest Service. 2006. Etolin Island Landscape Assessment.

USDA Forest Service. 2006. Wrangell Ranger District (Excluding Zarembo Island) Roads Analysis. Tongass National Forest. Wrangell Ranger District, Region 10. Wrangell, AK.

USDA Forest Service. 2006. TNF Revegetating Disturbed Sites on the Tongass National Forest Tongass National Forest Memo signed by Forest Supervisor Forrest Cole, July 28, 2006.

USDA Forest Service. 2007. Forest Service Handbook 1909.15 – Environmental Policy and Procedures Handbook. Chapter 31, Categories of Actions Excluded from Documentation. Sec. 12 Categories Established by the Chief. USDA Forest Service.

USDA Forest Service. 2007. Alaska Region, State of Alaska Department of Natural Resources Division of Forestry. Forest Health Conditions in Alaska-2006. R10-PR11, April 2007

USDA Forest Service. 2007. Wrangell Ranger District Access and Travel Management Plan Environmental Assessment. Tongass National Forest. Wrangell Ranger District, Region 10. Wrangell, AK.

USDA Forest Service. 2007. Forest Service Manual FSM 2000 National Forest Resource Management Chapter 2080- Noxious Weed Management Supplement R10 TNF-2000-2007-1, October 19, 2007

USDA Forest Service. 2008. Tongass National Forest Land and Resource Management Plan, Final Environmental Impact Statement, and Record of Decision. R-10-MB-603a-d (all volumes). USDA Forest Service, Alaska Region.

USDA. 1997. Departmental regulation 5600-002 Environmental Justice http://www.ocio.usda.gov/directives/doc/DR5600-002.pdf

USDA. 2008. Departmental regulation 9500-004 Fish and Wildlife Policy http://www.ocio.usda.gov/directives/doc/DR9500-004.pdf

Wemple, B.C. et al. 1996. Channel Network Extension by Logging Roads in Two Basins, Western Cascades, Oregon. Water Resources Bulletin. American Water Resources Association V 32 NO.6.

Wolfe, R.J. 2004. Local traditions and subsistence: A synopsis from twenty-five years of research by the State of Alaska. Technical Paper 284. Alaska Dept Fish Game, Division of Subsistence Juneau, AK.

Yoe, Jeffery J. and Peek, James M. 1992. Habitat Selection by Female Sitka Black-Tailed Deer in Logged forest of Southeastern Alaska. Department of Fish and Wildlife Resources, University of Idaho, Moscow, Idaho.

Index

A

access. 3-7, 3-11, 3-15, 3-16, 3-17, 3-41, 3-43, 3-57, 3-61, 3-62, 3-71, 3-75, 3-77, 3-80, 3-82, 3-88, 3-116, 3-118, 3-119, 3-120, 3-122, 3-123, 3-124, 3-125, 3-126, 3-131, 3-133, 3-135, 3-150, 3-158, 3-163, 3-170, 3-171, 3-172, 3-173, 3-175, 3-176, 3-177, 3-178, 3-179, 3-180, 3-183

Alaska Department of Fish and Game 3-1, 3-61, 3-80, 3-117, 3-118, 3-121, 3-122, 3-140, 3-165, 3-166, 3-175, 3-181

Alaska Department of Fish and Game (ADF&G) 3-175, 3-176, 3-180

Alaska National Interest Land Claims Act (ANILCA)..... 3-116, 3-117, 3-122

Alaska Native 1-11, 3-59, 3-60, 3-61, 3-116

Alaska yellow-cedar 3-4, 3-11, 3-12, 3-98, 3-99, 3-100, 3-102, 3-103, 3-104, 3-107

alder 3-56, 3-94, 3-105, 3-129

alternative development..... 2-5, 3-144

alternatives..... 2-6, 2-15, 3-13

anadromous 3-140, 3-141, 3-151, 3-152, 3-153

Army Corps of Engineers (ACOE) 3-157

B

Bald and Golden Eagle Protection Act.....3-184

bald eagle.....3-164, 3-166, 3-184, 3-185, 3-186

beach fringe 3-38, 3-100, 3-106, 3-165, 3-166, 3-180, 3-184, 3-185, 3-186

bear 3-165

Best Management Practices (BMPs) 2-15, 3-4, 3-111, 3-128, 3-149, 3-157, 3-159, 3-160

biodiversity 3-6, 3-26

biological diversity 3-164

blowdown 3-3, 3-17, 3-33, 3-68, 3-145, 3-154

brown creeper 3-42, 3-165

buffer

- beach 3-17, 3-19, 3-29, 3-43, 3-77, 3-86, 3-130, 3-131, 3-132, 3-186
- estuary 3-24, 3-41, 3-70, 3-71, 3-184
- RMA 3-52, 3-53, 3-140, 3-142, 3-143, 3-151, 3-154, 3-155
- TTRA 3-102, 3-145, 3-151, 3-154
- windfirm 2-6, 3-143, 3-149, 3-152

C

channel type.....3-140, 3-142

Clean Water Act 3-157

Clearcut 3-3, 3-13, 3-14, 3-34, 3-43, 3-56, 3-92, 3-94, 3-100, 3-101, 3-103, 3-106, 3-108, 3-110, 3-112, 3-145, 3-147, 3-169

clearcutting 3-160, 3-169, 3-180

Code of Federal Regulations (CFR) 1-11, 1-17, 3-35, 3-41, 3-45, 3-69, 3-70, 3-124, 3-133, 3-157, 3-187

Commercial Forest Land (CFL) 3-160

competition.....3-168, 3-172

connectivity 3-19, 3-26, 3-30, 3-31, 3-32, 3-33, 3-41, 3-159, 3-160

corridor 2-6, 3-19, 3-26, 3-28, 3-30, 3-31, 3-32, 3-33, 3-41, 3-42, 3-43, 3-45, 3-46, 3-54, 3-159, 3-161

Council on Environmental Quality (CEQ) 3-2, 3-6, 3-59
cumulative effects 3-124, 3-166, 3-169, 3-170, 3-186

D

deer... 3-26, 3-37, 3-61, 3-62, 3-79, 3-116, 3-117, 3-118, 3-119, 3-120, 3-121, 3-122, 3-123, 3-164, 3-165, 3-166, 3-168, 3-169, 3-170, 3-171, 3-172, 3-173, 3-174, 3-175, 3-176, 3-177, 3-178, 3-179, 3-180
desired condition 3-100, 3-105
disturbance 2-9, 3-6, 3-34, 3-43, 3-48, 3-51, 3-54, 3-55, 3-56, 3-67, 3-92, 3-98, 3-99, 3-101, 3-104, 3-108, 3-109, 3-111, 3-112, 3-113, 3-114, 3-144, 3-145, 3-149, 3-156, 3-157, 3-159, 3-163, 3-166, 3-185, 3-186, 3-187
Dolly Varden 3-151

E

economics 3-2, 3-7, 3-8, 3-10, 3-11, 3-12, 3-15, 3-16, 3-18, 3-54, 3-59, 3-61, 3-79, 3-84, 3-105, 3-128, 3-154
ecosystem 3-5, 3-34, 3-45, 3-54, 3-157
effects
- adverse 3-4, 3-41, 3-69, 3-108, 3-113, 3-142, 3-159
- cumulative 3-3, 3-8, 3-43, 3-44, 3-45, 3-54, 3-63, 3-64, 3-68, 3-70, 3-71, 3-72, 3-83, 3-84, 3-86, 3-94, 3-95, 3-96, 3-98, 3-105, 3-108, 3-114, 3-120, 3-124, 3-126, 3-135, 3-137, 3-138, 3-143, 3-149, 3-152, 3-154, 3-157, 3-163, 3-169, 3-187
- direct 3-13, 3-45, 3-64, 3-124, 3-143, 3-152, 3-186
- indirect 3-13, 3-15, 3-31, 3-38, 3-48, 3-50, 3-56, 3-62, 3-67, 3-70, 3-79, 3-80, 3-91, 3-101, 3-112, 3-124, 3-130, 3-144, 3-152, 3-160, 3-169, 3-177, 3-185
- short-term 3-6
- significant 3-6, 3-63, 3-135, 3-154

elk 3-37, 3-79, 3-118, 3-122, 3-168, 3-172, 3-176
erosion 3-54, 3-55, 3-56, 3-58, 3-71, 3-109, 3-111, 3-113, 3-114, 3-115, 3-127, 3-135, 3-145, 3-149, 3-155
essential fish habitat 3-144, 3-149, 3-154, 3-155
estuary 3-164, 3-165, 3-166, 3-184, 3-185, 3-186
even-aged management .. 3-3, 3-19, 3-47, 3-98, 3-99, 3-100, 3-101, 3-103, 3-104, 3-105, 3-106, 3-107, 3-169, 3-180
existing condition 3-72, 3-120, 3-137, 3-170, 3-172

F

fish
- habitat 3-110, 3-137, 3-138, 3-140, 3-141, 3-143, 3-144, 3-149, 3-151
- passage 3-138, 3-152, 3-153
- streams 3-70, 3-114, 3-138, 3-145, 3-152, 3-153, 3-155

fisheries
- commercial 3-8, 3-9, 3-60, 3-61
- sport 3-9, 3-62
- subsistence 3-9, 3-61, 3-62, 3-75

floodplain 3-109, 3-142
Forest Plan 1-4, 1-7, 2-6, 2-8, .. 3-1, 3-2, 3-4, 3-5, 3-6, 3-7, 3-8, 3-15, 3-18, 3-19, 3-20, 3-21, 3-24, 3-26, 3-31, 3-33, 3-34, 3-35, 3-38, 3-41, 3-42, 3-43, 3-52, 3-60, 3-61, 3-62, 3-64, 3-70, 3-73, 3-84, 3-85, 3-86, 3-87, 3-90, 3-91, 3-92, 3-93, 3-95, 3-96, 3-108, 3-109, 3-112, 3-114, 3-116, 3-117, 3-118, 3-119, 3-121, 3-123, 3-124, 3-142, 3-151, 3-153, 3-154, 3-155, 3-156, 3-158, 3-161, 3-164, 3-165, 3-166, 3-168, 3-169, 3-175, 3-176, 3-179, 3-184, 3-185, 3-186, 3-187, 3-188
- goals and objectives 3-124

forested wetlands 3-20, 3-157, 3-158, 3-159, 3-160, 3-161
fragmentation 3-19, 3-21, 3-33, 3-172
furbearer 3-117, 3-164, 3-180, 3-181

G

Game Management Unit (GMU) 3-165, 3-175, 3-176
geographic information system (GIS) .. 1-3, 1-17, 3-5, 3-12, 3-17, 3-26, 3-32, 3-36, 3-39, 3-40, 3-47, 3-48, 3-50, 3-65, 3-69, 3-74, 3-76, 3-78, 3-84, 3-85, 3-87, 3-88, 3-89, 3-90, 3-91, 3-100, 3-105, 3-113, 3-127, 3-130, 3-139, 3-142, 3-147, 3-148, 3-150, 3-161, 3-162, 3-169, 3-185, 3-189
goshawk 3-37, 3-187, 3-188, 3-189

H

habitat capability 3-62, 3-117, 3-118, 3-119, 3-120, 3-121, 3-166, 3-168, 3-169, 3-170, 3-171, 3-172, 3-173, 3-175, 3-176, 3-177, 3-179, 3-180, 3-181, 3-182, 3-183, 3-184, 3-187
hairy woodpecker 3-19, 3-42, 3-165
helicopter 3-166, 3-184, 3-185, 3-186
hemlock 3-98, 3-104
  mountain 3-98, 3-99
  western 3-10, 3-12, 3-98, 3-102, 3-103
heritage resources 3-69
hunter demand 3-62, 3-121, 3-179
hunting.... 3-9, 3-41, 3-51, 3-61, 3-62, 3-75, 3-79, 3-116, 3-117, 3-118, 3-120, 3-162, 3-168, 3-175, 3-176, 3-177, 3-178
  and trapping 3-41, 3-80, 3-117, 3-140, 3-162, 3-175, 3-176, 3-177, 3-178, 3-180, 3-182, 3-183
hydrology 3-48, 3-55, 3-68, 3-159, 3-160, 3-161

I

irretrievable commitments 3-4
irreversible commitments 3-4, 3-48
issues 1-11, 2-9, 3-6, 3-101, 3-105, 3-114, 3-126, 3-154, 3-175

J

jobs 3-5, 3-7, 3-8, 3-9, 3-10, 3-13, 3-14, 3-15, 3-16, 3-18, 3-60, 3-79

K

karst 3-41, 3-64, 3-66, 3-67, 3-68, 3-127

L

land use designation 3-1, 3-5, 3-51, 3-90
landslides 3-108, 3-109, 3-110, 3-111, 3-113, 3-145
log transfer facility (LTF) 3-4, 3-10, 3-11, 3-105, 3-125, 3-157, 3-159, 3-177, 3-184, 3-186
logging camp 3-60, 3-186
long-term productivity 3-4, 3-108, 3-111

M

maintenance levels 3-125, 3-133
Management Indicator Species (MIS) 3-164, 3-165, 3-168, 3-180
marine access facility 3-16, 3-125
marine access facility (MAF) 3-124

marine habitat....3-138, 3-150, 3-151, 3-156
market demand.... 2-2, 3-7, 3-8, 3-15
marten 3-164, 3-166, 3-180, 3-181, 3-182, 3-183, 3-184
Memorandum of Understanding (MOU) 3-166, 3-184, 3-185, 3-186
mining 3-51
mitigation 3-52, 3-53, 3-57, 3-155, 3-160
mitigation measure 1-5, 1-11, 2-6, 2-15, 2-16, 3-157
mixed conifer 3-56
model . 3-15, 3-24, 3-32, 3-70, 3-72, 3-99, 3-108, 3-111, 3-117, 3-118, 3-119, 3-120, 3-121, 3-122, 3-148, 3-164, 3-168, 3-169, 3-170, 3-172, 3-175, 3-176, 3-177, 3-179, 3-180, 3-182
monitoring.... 1-5, 3-5, 3-6, 3-53, 3-59, 3-71, 3-108, 3-111, 3-128, 3-129, 3-145, 3-156, 3-168, 3-175
moose 3-61, 3-168
motorized 3-34, 3-57, 3-62, 3-73, 3-74, 3-77, 3-78, 3-81, 3-82, 3-120, 3-122, 3-125, 3-176, 3-177, 3-178, 3-179
murrelet 3-37
muskeg 3-30, 3-66, 3-67, 3-109, 3-127

N

National Environmental Policy Act (NEPA) 3-2, 3-7, 3-10, 3-13, 3-47, 3-59, 3-187
National Forest Management Act (NFMA) 2-8, 3-45, 3-84
National Historic Preseervation Act (NFMA).... 3-69

O

old-growth....3-164, 3-165, 3-166, 3-168, 3-172, 3-180, 3-184
forest 3-19, 3-20, 3-26, 3-51, 3-118, 3-180, 3-187
habitat 3-5, 3-19, 3-20, 3-21, 3-31, 3-33, 3-187
habitat reserves.... 3-20
productive 3-23, 3-41, 3-51, 3-106, 3-188
other landowners.... 3-125
otter 3-165

P

partial cut 3-112
past timber harvest 3-165
patch.... 3-168
permits 3-4, 3-72, 3-80, 3-81, 3-82, 3-116, 3-124, 3-128, 3-129, 3-150, 3-151, 3-156, 3-159, 3-169
pinch point 3-19, 3-30, 3-31, 3-32, 3-33, 3-41, 3-154
preferred alternative 2-1, 3-157
productive old growth (POG)....3-168, 3-184, 3-186
proposed action 1-2, 2-12, 3-13, 3-45, 3-53, 3-59, 3-116, 3-136, 3-187
public comments 1-11, 2-1, 3-119, 3-123, 3-129, 3-156
public involvement.... 3-1, 3-13

R

Recreation 2-8, 3-3, 3-34, 3-37, 3-41, 3-51, 3-61, 3-72, 3-73, 3-74, 3-75, 3-77, 3-78, 3-79, 3-80, 3-81, 3-82, 3-83, 3-84, 3-90, 3-137
red-breasted sapsucker 3-165

regeneration 2-8, 3-94, 3-99, 3-100, 3-101, 3-102, 3-103, 3-104, 3-105, 3-106, 3-107, 3-160
retention 3-19, 3-20, 3-31, 3-32, 3-33, 3-42, 3-43, 3-47, 3-68, 3-94, 3-101, 3-104, 3-105, 3-112, 3-144, 3-157, 3-160, 3-171, 3-183
riparian ... 3-20, 3-24, 3-26, 3-28, 3-33, 3-42, 3-52, 3-56, 3-101, 3-105, 3-138, 3-140, 3-142, 3-143, 3-145, 3-149, 3-151, 3-152, 3-155, 3-165, 3-166, 3-180, 3-184
  areas 3-20, 3-56
  buffer 3-28, 3-42, 3-52, 3-143
  harvest 3-143, 3-145
riparian area 2-6, 3-180, 3-184
riparian management area (RMA) 3-184
road 3-159, 3-160
  construction 3-38, 3-56, 3-68, 3-105, 3-108, 3-115, 3-124, 3-127, 3-149, 3-158
  construction, ... 3-159
  maintenance 3-13, 3-126, 3-133, 3-135, 3-145
  reconditioning 3-134, 3-135
road construction 2-9, 3-157, 3-159, 3-161, 3-163, 3-171, 3-173, 3-177, 3-182, 3-183, 3-185
roadless area 3-34, 3-35, 3-37, 3-39, 3-41, 3-42, 3-43, 3-154
roads .. 3-118, 3-157, 3-160, 3-161, 3-170, 3-172, 3-175, 3-176, 3-177, 3-178, 3-179, 3-180, 3-182, 3-183, 3-184, 3-185, 3-186
rock pit 3-54, 3-55, 3-56, 3-68, 3-94, 3-108, 3-111, 3-113, 3-115, 3-127, 3-129, 3-185

S

Saxman 1-11
salmon 3-116, 3-117, 3-119, 3-137, 3-151, 3-155, 3-165
scenery 3-41, 3-43, 3-75, 3-80, 3-84, 3-86, 3-90, 3-91, 3-92, 3-95, 3-96, 3-101, 3-105
scenic integrity objective 3-41, 3-84, 3-86, 3-91, 3-92, 3-93, 3-94, 3-95, 3-103
scenic viewshed 3-90, 3-91, 3-92, 3-93, 3-131
scoping 3-51
second growth 3-86, 3-93, 3-168, 3-169
sediment 3-48, 3-64, 3-67, 3-68, 3-110, 3-111, 3-114, 3-137, 3-140, 3-141, 3-144, 3-145, 3-148, 3-149, 3-151, 3-152, 3-156, 3-157, 3-160
selection 3-180, 3-184
sensitive species 2-8, 3-34, 3-45, 3-52, 3-187
shellfish 3-116
silvicultural
  activities 3-98, 3-159
  prescriptions 3-11
  systems 3-98, 3-99, 3-105, 3-169, 3-180
Sitka 3-168, 3-170, 3-175
slopes . 2-8, 3-6, 3-14, 3-67, 3-92, 3-94, 3-97, 3-108, 3-109, 3-110, 3-111, 3-112, 3-114, 3-125, 3-127, 3-131, 3-145, 3-149, 3-156, 3-188
soil 3-157, 3-160, 3-161, 3-162
  erosion 3-111
  productivity 3-108, 3-109, 3-113
soils
  disturbance 3-108, 3-109, 3-111, 3-113

erosion 3-109
productivity 3-4, 3-108, 3-109, 3-111, 3-114, 3-115
sortyard 3-56, 3-134
species composition 3-55, 3-98, 3-101, 3-105, 3-160
spruce, Sitka 3-10, 3-11, 3-12, 3-98, 3-101, 3-102, 3-103, 3-104
standards and guidelines 2-6, 2-8, 2-15, 3-4, 3-26, 3-28, 3-33, 3-43, 3-52, 3-70, 3-84, 3-90, 3-95, 3-96, 3-108, 3-114, 3-116, 3-124, 3-142, 3-151, 3-154, 3-165, 3-166, 3-175, 3-184, 3-185, 3-186, 3-187, 3-188
State Historic Preservation Officer (SHPO) 2-6, 3-69
steelhead 3-151
stream class
Class I 3-131, 3-140, 3-142, 3-143, 3-149, 3-153, 3-155
Class II 3-67, 3-140, 3-142, 3-143, 3-149, 3-150, 3-153, 3-155
Class III 3-102, 3-140, 3-141, 3-149, 3-155
Class IV 3-66, 3-68, 3-141, 3-143
stream crossings 3-127, 3-131, 3-145, 3-149, 3-151, 3-155
structure 3-166
subsistence .. 1-11, 3-1, 3-3, 3-9, 3-59, 3-60, 3-61, 3-62, 3-63, 3-116, 3-117, 3-118, 3-119, 3-120, 3-121, 3-122, 3-123, 3-126, 3-162, 3-164, 3-168
succession 3-106
suitable
timber lands 3-98

T

thinning
precommercial 3-47, 3-100, 3-102, 3-103, 3-106
Threatened and Endangered Species 2-8, 3-187
timber
harvest 2-9, 2-11, 3-4, 3-6, 3-7, 3-9, 3-12, 3-14, 3-15, 3-20, 3-21, 3-24, 3-26, 3-28, 3-30, 3-31, 3-33, 3-34, 3-35, 3-37, 3-38, 3-41, 3-42, 3-43, 3-44, 3-47, 3-48, 3-49, 3-50, 3-51, 3-53, 3-56, 3-60, 3-62, 3-68, 3-70, 3-71, 3-78, 3-80, 3-82, 3-83, 3-86, 3-92, 3-93, 3-94, 3-101, 3-104, 3-106, 3-108, 3-114, 3-117, 3-118, 3-119, 3-120, 3-121, 3-123, 3-124, 3-125, 3-126, 3-143, 3-144, 3-145, 3-147, 3-151, 3-157, 3-158, 3-159, 3-160, 3-161, 3-162, 3-164, 3-165, 3-166, 3-168, 3-169, 3-171,3-172, 3-173, 3-175, 3-177, 3-180, 3-187, 3-181, 3-185, 3-186, 3-188
harvest units 2-8, 3-15, 3-70, 3-147
harvest volume 2-10, 3-11, 3-15, 3-169, 3-180
timber harvest systems
cable 2-6, 3-11, 3-12, 3-14, 3-17, 3-34, 3-39, 3-44, 3-47, 3-80, 3-81, 3-105, 3-108, 3-111, 3-112, 3-154
helicopter . 3-11, 3-12, 3-14, 3-15, 3-17, 3-19, 3-31, 3-34, 3-39, 3-44, 3-60, 3-78, 3-80, 3-81, 3-93, 3-96, 3-104, 3-105, 3-106, 3-108, 3-112, 3-128, 3-144, 3-154, 3-186
shovel 3-11, 3-12, 3-14, 3-15, 3-17, 3-39, 3-93, 3-111
timber sales 3-171
Tongass National Forest 3-164
Tongass Timber Reform Act (TTRA) 3-102, 3-145, 3-154
tourism 3-9
trails 3-157
tribal governments 1-11

trout 3-117, 3-119, 3-151
two-aged management 3-19, 3-43, 3-98, 3-100, 3-103, 3-104, 3-105, 3-107

U

U.S. Fish and Wildlife Service (USFWS) 3-175, 3-184, 3-186, 3-187
uneven-aged management 3-98, 3-101, 3-104, 3-105

V

value comparison unit (VCU) 3-1
vegetation 3-157, 3-168, 3-185
viable population 3-187
volume strata 3-20, 3-168, 3-180, 3-189

W

water quality 3-138, 3-140, 3-141, 3-143, 3-144, 3-149, 3-153, 3-154, 3-155
waterfowl 3-75, 3-165
watersheds 3-2, 3-37, 3-60, 3-137, 3-138, 3-140, 3-141, 3-143, 3-144, 3-145, 3-148, 3-149, 3-152, 3-153, 3-165
western redcedar 3-10, 3-12, 3-98, 3-102, 3-104
wetlands 2-9, 3-20, 3-41, 3-52, 3-66, 3-67, 3-68, 3-128, 3-157, 3-158, 3-159, 3-160, 3-161, 3-162, 3-163, 3-165
wilderness 3-2, 3-34, 3-37, 3-42, 3-43, 3-79, 3-166, 3-171, 3-178, 3-180
wildlife analysis area (WAA) 3-1, 3-19, 3-60
wildlife habitat 3-4, 3-19, 3-100, 3-101, 3-106, 3-166
windfirm 3-99, 3-102, 3-143, 3-155
windthrow 3-6, 3-64, 3-99, 3-100, 3-101, 3-102, 3-104, 3-105, 3-109, 3-114, 3-143, 3-155
winter habitat 3-164, 3-168, 3-170, 3-176, 3-180
winter range 3-169, 3-172, 3-173, 3-178
Wrangell Access and Travel Management Environmental Assessment (ATM EA) 3-124, 3-126, 3-133, 3-134
Wrangell Cooperative Association (WCA) 3-69