Chapter 3
Environment and Effects

Chapter 3

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Chapter 3
Environment and Effects

Introduction

This chapter provides information concerning the existing environment of the Central Kupreanof Timber Harvest (Project Area), and potential environmental consequences of the proposed action and alternatives to it. It also presents the scientific and analytical basis for the comparison of alternatives presented in Chapter 2. Each resource potentially affected by the proposed action or alternatives is described by its current condition and uses.

Following each resource description is a discussion of the potential environmental effects to the resource associated with the implementation of environmental effects to the resource associated with the implementation of each alternative. All significant or potentially significant effects, including direct, indirect and cumulative effects, are disclosed. Effects are quantified where possible, and qualitative discussions are also included. The means by which potential adverse effects will be reduced or mitigated are described in Appendix B (see also the unit cards in the DEIS and road cards in Appendix B of this FEIS).

The discussions of resources and potential effects take advantage of existing information included in the Forest Plan Final EIS, other project EISs, project specific resource reports and related information, and other sources as indicated. Where applicable, such information is briefly summarized and includes all project-specific information, including resource reports and other results of field investigations. The record also contains information resulting from public involvement efforts. The project record is located at the Petersburg Ranger District Office in Petersburg, Alaska, and is available for review Monday through Friday, from 8 am to 4:30 pm, except holidays.

Ecological and Administrative Land Divisions

The land area of the Tongass National Forest has been divided in several different ways to describe the different resources and allow analysis of how they may be affected by Forest Plan and project-level decisions. These divisions vary by resource since the relationship of each resource to geographic conditions and zones also varies. The allocation of Forest Plan land use designations (LUDs) is one such division. Other divisions important for the present effects analysis are described briefly here.

Project Area

The project area is identified by the Interdisciplinary Team (IDT) to define the boundary of the area in which the project will occur. For the Central Kupreanof Timber Harvest, the area includes Value Comparison Units 4260, 4271, 4380, 4290, and 4360.

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. Chapter 1 includes a map showing the VCUs location (See Figure 1-2).

Wildlife Analysis Areas (WAAs)

These are land divisions that correspond to the "Minor Harvest Areas" used by the Alaska Department of Fish and Game to report community harvests of selected wildlife species. Approximately 190 apply to the Tongass National Forest. The project area includes portions of WAAs 5130, 5131, 5132, and 5133.

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 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. Seven watersheds were analyzed in the Central Kupreanof project area.

Inventoried Roadless Area

Inventoried roadless areas are undeveloped areas typically exceeding 5,000 acres that met the minimum criteria for wilderness consideration under the Wilderness Act and that were inventoried during the Forest Service's Roadless Area Review and Evaluation (Rare II) process, subsequent assessments, or forest planning. The Central Kupreanof project falls within four Inventoried Roadless Areas: North Kupreanof, South Kupreanof, Castle, and Rocky Pass.

Biogeographic Province

This designation refers to 21 ecological subdivisions of Southeast Alaska that are identified by generally distinct ecological, physiogeographic, and biogeographic features. Plant and animal species composition, climate, and geology within each province are

generally more similar within than among adjacent provinces. Historical events (such as glaciers and uplifting) are important to the nature of the province and to the barriers that distinguish each province. Central Kupreanof project area is part of the Kupreanof/Mitkof Islands Biogeographic Province.

Analyzing Effects

Environmental consequences are the effects of implementing an alternative on the physical, biological, social and economic environment. The Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) includes a number of specific categories to use for the analysis of environmental consequences. Several are applicable to the analysis of the proposed project and alternatives, and form the basis of much of the analysis that follows.

Direct, Indirect and Cumulative Effects

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

Reasonably Foreseeable Future Actions

An analysis of cumulative effects must also include "reasonably foreseeable future actions" (40 CFR 1508.7) This can include National Forest System timber sales and other management activities as well as land management activities of other landowners on nearby lands. Reasonably foreseeable future actions are those that are currently planned.

Unavoidable Adverse Effects

Implementation of any action alternative would cause some adverse environmental effects that cannot be effectively mitigated or avoided. Unavoidable adverse effects often result from managing the land for one resource at the expense of the use or condition of other resources. Many adverse effects can be reduced, mitigated or avoided 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, project-specific mitigation measures, and monitoring are all intended to further 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 will occur. The purpose of this chapter is to fully 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. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished and grown again if the long-term productivity of the land is maintained.

This long-term productivity is maintained through-out the application of the resource protection measures described in Chapter 2, in particular, those applying to the soil and water reserves. These protection measures are also discussed throughout this chapter, in particular for soils, water quality, biodiversity and economics.

Irreversible and Irretrievable Commitments

Irreversible commitments describe a 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 of time. Once these resources are gone, they cannot be replaced.

Irretrievable commitments apply 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.

Where they occur related to the Central Kupreanof Timber Harvest (Project Area), irreversible or irretrievable commitments are identified; those commitments are summarized here. Roads built on wetlands are an irreversible and irretrievable commitment of wetlands. Loss of timber productivity in areas proposed for new NFS road construction is considered an irretrievable commitment.

Available Information

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

There is incomplete knowledge about many of the relationships and conditions of wildlife, fish, forests, climate change, jobs and communities. The ecology, inventory and management of a large forest area is a complex and developing science. 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 consequences.

Community Profiles

Kake

The potential impact to nearby communities with processing facilities that may utilize the timber will depend on many elements associated with the competitiveness and efficiency of individual operations. Such factors are dependent upon private business decisions as well as market conditions for forest products. The Forest Service cannot predict which firms will successfully bid for a timber sale, thus potential community benefits relating to jobs and incomes associated with a sale will not be predicted specifically, but in a regional summary.

Kake is the nearest community to the Project Area and is the most likely to be affected socially and economically by the project in terms of subsistence, recreation, tourism, and general local use of the area. Other nearby communities include Petersburg and Wrangell. The information gathered for the community profiles came from the Alaska Department of Commerce Community and Economic Development web page (Alaska Community Database (ADCCED) 2007).

Data collected at the census area level may not reflect specific community trends in Kake but is useful in subdividing the region into smaller study areas. Where it is possible, community-level data has been displayed.

Kake is a Tlingit village and was the first Alaska Native village to organize under federal law in the early 1900s. The Organized Village of Kake (OVK), a federally recognized tribe, is located in the community and has a tribal membership of 480. Traditional customs are very important to the community. Kake residents are dependent upon subsistence opportunities as economic supplements.

The population of Kake grew steadily over the last century until 2000 when the population began to decline. In 1990 and 2000, the population of Kake was reportedly 700 and 710, respectively. By 2003 the population had fallen to 682, and by 2007 the population was

estimated to be 536, which is a 16 percent decline in six years. According to residents of Kake the latest population estimate was 519 people. The population of the community is nearly 75 percent American Indian (Alaska Native) with the remaining residents mostly White American.

In Kake, the city, school district, Organized Village of Kake (OVK) and Southeast Alaska Regional Health Consortium (SEARHC) are the largest employers. Approximately 32 percent of the employed population of Kake work for a government entity, about 60 percent are privately employed, and the remaining are sole proprietors. Fishing contributes considerably to the economy. Sixty-seven residents hold commercial fishing permits. The non-profit Gunnuk Creek Hatchery has assisted in sustaining the salmon fishery.

Kake's economy was hit hard after 2003 when two of their major employers, Kake Tribal Logging and Timber and Kake Foods, virtually eliminated their workforce. Kake Tribal reduced its number of jobs by 97 percent while Kake Foods reduced it employment by 90 percent. Kake has since been deemed a "distressed community" by the Denali Commission. According to the commission, a distressed community is one that meets the following criteria:

- Per capita market income not greater than 67 percent of the U.S. average: and
- Poverty rate at 150 percent of the U.S. average or greater: and
- Three-year unemployment rate at 150 percent of the U.S. average or greater; or
- Twice the U.S. poverty rate and either (1) or (3) above.

Based on the 2003 data, the Denali Commission estimates Kake's average market income as below the threshold level and estimates that more than 70 percent of residents aged 16 and over earn less than the threshold. Recreation and tourism opportunities are increasing in some parts of the region but it appears some further development and infrastructure is needed to strengthen these sectors and increase higher wage employment. Kake is currently pursuing tourism income and opportunities, but has not experienced the increase in tourism that larger communities in the region have.

Other Communities

The City of Kupreanof is located on the east side of Kupreanof Island across the Wrangell Narrows from Petersburg. It was incorporated as a second class city in 1975. The population was estimated to be 27 people in 2008.

Petersburg is situated on the northwest shore of Mitkof Island at the north end of Wrangell Narrows approximately 20 miles southeast of

the Project Area. The 2007 population estimate for Petersburg was 3,072.

Wrangell is on the northern tip of Wrangell Island, approximately 60 mile southeast of the Project Area. The 2007 population estimate was 2,062. The community began as an important Tlingit village primarily because of its proximity to the Stikine River. Today timber, fishing and fish processing are the main components of Wrangell's economy, and tourism has been a growing economic sector in recent years.

Environmental Justice/Civil Rights

A specific consideration of equity and fairness in resource decision-making is encompassed in the issue of environmental justice and civil rights. As required by law and Title XI, all federal actions will consider potentially disproportionate effects on minority or low-income communities. Environmental justice issues regarding road development and timber harvest are considered by decision-makers. Disproportional potential impacts or changes to low-income or minority communities in the Project Area due to the proposed action should be considered. Where possible, measures should be taken to avoid impact to these communities or mitigate the adverse effects.

Kake, though not in the project area, is adjacent to the project area and has a long history of local use. Kake's population is about 75 percent Native and has been considered in the analysis of the proposed alternatives for disproportional impacts. The Organized Village of Kake was consulted and encouraged to comment at any point in the process to ensure their concerns would be addressed. Public meetings were also held in Kake to assist people in understanding the alternatives and how issues were addressed. These meetings also gave the public opportunities to highlight other issues and concerns they had. The Heritage Resource Report for the Central Kupreanof FEIS discusses the cultural environment of the area and addresses our responsibilities according to historic preservation laws and regulations. There are no known historic properties (cultural resources) within the area of potential effect. Native traditional values were considered, particularly those associated with subsistence use of the project area. Native populations should not be disproportionately impacted under any alternative.

Other Resources

Several resources and uses of the project area are likely to remain unaffected by the proposed action or alternatives. Resources or uses for which no measurable effects were identified are discussed briefly here.

Air Quality

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 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.

Climate Change

Forest-wide analysis conducted for 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 National Forest. There is a risk that climate change may result in increased blowdown, increased tree mortality from insects and disease, increased fire frequency and severity, adverse effects on air quality, changes to vegetation, streams, fish and wildlife habitat, and subsistence and recreation uses of the National Forest. The 2008 Forest Plan FEIS contains considerable information on potential climate change effects on resources such as yellow-cedar, hydrology, fisheries, plants, and forest health. In this context, climate change is not essential to a reasoned choice among the alternatives considered in the Central Kupreanof 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 need for a different course of action that might affect the Central Kupreanof project will be addressed through existing planning procedures to determine whether changes in the Central Kupreanof project management are warranted.

Land Status

Under the Alaska Statehood Act of 1959, the State of Alaska is entitled to a certain amount of Federal land. The State was also allowed to identify for selection more acreage than would ultimately be conveyed to State ownership. There are no State-selected lands within the project area. Other legislation granted Alaska Native corporations similar selection rights. The CEQ regulation implementing NEPA require a determination of possible conflicts between the proposed action and the objectives of Federal, State, and local land use plans, policies, and controls for the area.

Issue 1-

Timber Supply/Sale Economics

Optimizing volume and net return on timber harvest will provide for flexibility, in both the long and short term, for offering economically viable timber sales.

Timber harvest economics is an issue involving the ability of Southeast Alaska's timber purchasers to make a profit and stay in business. Loss of this business would negatively impact the ability to maintain the economic health of local communities. Timber purchasers and affected communities are concerned about the quantity, quality, reliability, and profitability of the timber offered for sale from the Tongass National Forest. If proposed timber harvest is not designed to be economically viable across fluctuating market conditions, there is a concern that the forest products industry in Southeast Alaska may not remain viable.

Comments received during the scoping period, and after the DEIS was published, offered suggestions for improving overall timber harvest economics on the Tongass National Forest and for the Central Kupreanof project. Suggestions included: stop building roads; all roads required for the sale should be temporary roads; build new roads to provide for long-term timber management; volumes should be large enough to amortize the cost of mobilization; and consider small sales and Microsales.

There are many factors that can increase the cost of timber harvesting, such as logging systems, setting size, silvicultural prescriptions, haul/tow distances, and miles of road construction, re-construction, and maintenance. These costs may carry significant economic risk for potential purchasers as well as the ability of the Forest Service to offer timber sales. The value of the timber offered must be sufficient to cover this cost and offer a potential for profit to purchasers.

Because the value of timber fluctuates with market demand, volume made available with the Central Kupreanof project will allow the Forest Service to respond to these conditions by providing sale packaging flexibility to offer the most economically viable timber sales. The Central Kupreanof project will also provide an opportunity

for timber purchasers to respond to market conditions by having sufficient volume under contract.

Measurement:

The unit of measures to compare alternatives will include

- Total volume (sawlog and utility) measured in million board feet (MMBF),
- Logging costs per thousand board feet (MBF),
- Indicated bid - dollars per MBF
- Employment in number of direct jobs
- Direct income based on projected employment and
- Logging systems by harvest method (acres).

The NEPA Economic Analysis Tool Residual value (NEAT_R) is the Forest Service, Alaska Region, financial efficiency and economic analysis program for use in timber planning. The NEAT_R model runs are one tool to gauge current economics for an alternative, but it does not provide a complete picture. A greater number of units, and the more volume made available, allows greater diversity and flexibility, as well as the ability to respond to future market conditions.

The following discussion and analysis of timber sale economics is based on referenced sources including NEAT_R version 2.15 (R10 Supplement FSH 2409.18 and NEAT_R User's Guide, 2008). More information about NEAT_R and the methodology is located in the project record.

Timber Supply and Economics-Affected Environment

Employment in Southeast Alaska

About 70,000 people live in towns, communities, and villages located on islands and coastal lands of Southeast Alaska (ADCCED, 2007). The Southeast Alaska region accounts for about 12 percent of the State's population and 6 percent of the land base. Federal lands comprise about 95 percent of Southeast Alaska, 80 percent within the Tongass National Forest. Southeast Alaska communities, which are within or adjacent to the Tongass National Forest, are largely dependent on the Forest to provide natural resources for employment. This includes commercial fishing, timber harvest and processing, tourism, and mining. The forest is also needed for recreation and subsistence use.

Forest Products Employment

The forest products industry has been an important part of the economy of Southeast Alaska since settlement, with sharp growth in the 1950s due to the start of the pulp mills. Employment declined considerably in 1997 primarily due to the closure of the Ketchikan Pulp Company pulp mill. Recent forest products employment data are presented in Table 3-1.

Table 3-1. Forest Products Industry Employment in Southeast Alaska 2002 through 2007[4]

Year[1]	Tongass Logging[2]	Tongass Sawmill	Tongass-Related Employment[3]	Other Sawmill	Other Logging	Total Industry Employment
2002	63	110[4]	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
2007	44	70	114	63	225	402

Source: Alaska Department of Labor, Kilborn et al. (2004), Brackley et al. (2006), Parrent 2006 and 2007, and Kilborn 2008. Data on file with: Regional Economist, Ecosystems Planning, USDA Forest Service, PO Box 21628, Juneau, AK 99802-1628.

[1] Reported in calendar years.

[2] Tongass National Forest logging estimated based on the ratio of Tongass timber harvest to total timber harvest in Southeast Alaska.

[3] Through 2001, assumes all sawmill and pulp mill employment is dependent upon Tongass National Forest timber supply. From 2002 to 2005, this assumption no longer held. Data from Kilborn et al. (2004), Brackley et al. (2006b), Parrrent 2006 and 2007, and Kilborn 2008 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, 65 percent in 2005, and 62 percent in 2006, and 53% in 2007. Tongass National Forest sawmill employment from 2002 through 2007 is estimated based on sawmill employment numbers and the ratio of sources of wood (Federal versus the total) reported by Kilborn et al. (2004), Brackley et al.(2006b), Parrent 2006 and 2007, and Kilborn 2008.

[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. Beginning in 2001, sawmill employment figures are adjusted based on regional mill studies, which take into account self-employed mill owners.

Past, Current and Reasonably Foreseeable Future Timber Harvest in the Project Area

Considerable timber harvest has occurred in VCUs 4250 and 4271 and on private Native Corporation lands to the north. Past timber management activities in the Central Kupreanof project area began in 1975 using clearcut cable yarding. Larger-scale clearcut logging began in 1979 and continued through 2003 resulting in approximately 4,600 acres of clearcut harvest on National Forest System lands. For more detailed information regarding past harvest in the project area, refer to the Catalog of Events, in Appendix C. Currently, no large-scale harvest is occurring on either private or NFS lands. Two to three small sales associated with the 6367 Small Timber Sale CE, consisting of approximately 60 total acres of clearcut with reserves on NFS lands, just north of the project area, will likely occur in 2009 through 2012. Microsales associated with the Kake I Microsale CE (2008), may occur along NFS road 6040 in the project area. In following years, Microsales may also occur along open NFS roads or NFS roads adjacent to the project area depending on demand.

Timber Supply and Market Demand

Determining market demand is a complex process. Detailed explanations of the rationale for considering timber harvest in the Central Kupreanof project area and market demand for wood products is located in Appendix A of this document. The 2008 Forest Plan amendment FEIS, Volume 1, and Appendix G, describes the latest timber demand analyses and projections.

Timber Sale Economics

There are several factors that enhance the economic potential of the Central Kupreanof project area, and may in turn affect the timber supply to the forest products industry. These factors include an existing road system, Log Transfer Facility (LTF) infrastructure and feasibility of cost-effective logging systems. The amount of timber volume will have an effect on employment as shown in Table 3-7 which displays the support to direct employment that will result from logging and milling the volume in the timber sale.

Road Access and Log Transfer Facility

The Central Kupreanof project will use the existing road system and the existing Little Hamilton LTF. Approximately 79 miles of NFS roads exist in the project area. All the action alternatives will require additional road segments to access timber. In some cases these new roads will shorten helicopter yarding distances. Table 3-2 shows the amount of existing and proposed roads by alternative within the

project area. More information about roads and the LTF is found in the Transportation section and resource report.

Table 3-2. Existing and Proposed Miles by Alternative within the Project Area

	Miles by Alternative			
	1	**2**	**3**	**4**
Existing NFS Road	79	79	79	79
Proposed NFS Road	0	7.3	25.1	0
Proposed NFS Road Reconstruction	0	2.9	9.1	2.6
Proposed Temporary Road	0	3.9	6.1	2.2

Source: Tongass GIS 2008

Silvicultural Prescriptions

Generally, the less complex a silvicultural prescription the more cost efficient it is to implement. Even-aged management using the clearcut prescription usually results in less cost associated with logging because it is more efficient due to increased production and the ability to use less expensive equipment.

All action alternatives propose primarily even-aged clearcut prescriptions. Alternatives 2 and 3 include uneven-aged single tree selection prescriptions where helicopter yarding is proposed. Alternative 2 includes a minor amount of two-aged, clearcut with reserves prescription. See the Silviculture and Vegetation section and resource report for more information.

The single tree selection prescription is only used in conjunction with helicopter yarding for this project. Single tree selection will allow the harvest of individual trees. Helicopter yarding also addresses resource concerns related to Forest Plan Standards and Guidelines, and allows access to areas that are considered otherwise inaccessible for typical road construction.

Effects on Timber Economics

Logging Systems

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

Cable yarding systems are best suited for steep slopes and are most efficient using the clearcut harvest method. The average cost of cable yarding for all alternatives in this analysis is $211 per MBF.

Shovel yarding is the least costly yarding method used in this analysis. 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 than cable yarding systems. The average cost of shovel yarding for all alternatives in this analysis is $164 per MBF.

Helicopter yarding is the most expensive yarding method. Yarding distance, turn time (the time it takes the helicopter to make a round trip from landing to the unit and return), weight of each turn 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. Helicopter yarding works well for a variety of prescriptions; however, it is commonly used with partial harvest prescriptions. The average cost of helicopter yarding for all alternatives in this analysis is $356 per MBF.

Table 3-3. Yarding System and Harvest Method (Acres)

Yarding System - Harvest Method	Alternatives			
	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Cable - Clearcut	0	981	1,638	567
Cable - Clearcut with 10% Retention	0	90	90	26
Shovel - Clearcut	0	934	1,373	721
Shovel - Clearcut with 10% Retention	0	26	26	13
Shovel - Clearcut with Reserves (50% Retention)	0	33	0	0
Helicopter - Single Tree Selection (60% Retention)	0	442	520	0

Source: Tongass GIS 2008

The Central Kupreanof project alternatives were evaluated using NEAT_R Version 2.15 based on an appraisal point of Wrangell (FSH 2409.18, 45.11). The results are displayed in Table 3-4. The values used reflect data updated for the 3rd Quarter 2007 and incorporate cost estimates updated in June, 2008 and the Limited Interstate Shipping Policy (Regional Forester 2400 memo, March 14, 2007).

Logging costs evaluated in the NEAT_R financial efficiency analysis included truck hauling of logs to the Little Hamilton LTF, and barging

to the Silver Bay Mill in Wrangell which is the closest appraisal point. On average, barging costs were estimated to be $80 per MBF.

Timber Financial Efficiency Analysis

One method to compare the effects of the different alternatives is through a financial efficiency analysis which is a comparison of those costs and benefits that can be quantified in terms of actual dollars spent or received within the project area. 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. 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 one tool decision makers can use to gain information about resources, alternatives, and trade-offs between costs and benefits. 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.

Table 3-4. Timber Financial Efficiency Analysis

	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Volume - Sawlog (MBF)				
Sitka Spruce	0	7,051	10,425	3,960
Hemlock	0	26,487	40,057	16,449
Western redcedar	0	125	191	79
Alaska Yellow-Cedar	0	5,733	8,400	3,119
Total Sawlog Volume (MBF)	0	39,396	59,073	23,606
Pond Log Value $/MBF[1]	$0	$287	$281	$268
Stump to Mill Cost $/MBF	$0	$374	$410	$353
Indicated Value[2] ($ millions)	$0	($3.4)	($7.6)	($2.0)
Indicated Rate $/MBF	$0.00	($86.42)	($129.16)	($85.46)

Source: NEAT_R Version 2.15 (June, 2008 output)
[1] Numbers may not add up to the totals shown due to rounding.
[2] ( ) indicates negative value
NEAT_R Version 2.15 (incorporates the Limited Interstate Shipping Policy)

The harvest volumes, indicated value, costs and net stumpage values used in this document are current estimates and useful for comparing relative differences between alternatives and are not meant to reflect absolute values. Merchantable timber within units and any road right-of-way located on National Forest System 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. Sales with volumes under 250 MBF do not require an appraisal and can be advertised using established standard rates.

The difference in indicated bid rates among the action alternatives can be attributed to multiple factors, including:

- Differences in species composition, volume per acre harvested, and timber quality
- Difference in harvest prescriptions
- Proportion of cable, shovel and helicopter yarding systems
- Amount of road construction and reconstruction
- Differences in haul distances

Timber Volume Calculations

Total unit net volumes by alternative were calculated using NEAT_R Version 2.15 and based upon average per acre volume for the high, medium and low volume strata. Volume strata averages are based on 2006 and 2007 stand exam data. Volumes for the alternatives are displayed in million board feet (MMBF) in Table 3-5.

Table 3-5. Estimated Volume in MMBF

Estimated Volume	Alternatives			
	1	**2**	**3**	**4**
Sawlog	0	39.4	59.1	23.6
Utility	0	7.4	11.2	4.5
Total	**0**	**46.8**	**70.2**	**28.2**

Source: NEAT_R Version 2.15 June, 2008 output

Opportunities to Improve Economics

There are many factors that can increase the cost of timber harvest. These costs may carry significant economic risk for potential purchasers as well as the ability of the Forest Service to offer timber sales. Road construction, helicopter yarding, silvicultural prescriptions other than clearcutting, setting size and other factors may increase costs. Those increased costs will then affect the timber value for the alternatives. The value of the timber offered must be sufficient to cover this cost and offer a potential for profit to purchasers. Because markets fluctuate, volume made available with the Central Kupreanof project should allow the Forest Service to respond to these conditions when packaging timber sales. Alternative design and volume levels affect sale packaging flexibility for offering the most economically viable timber sales. Also, the larger the timber sale volume, the greater the ability an operator has to respond to market conditions with the volume they have under contract.

The costs used in the current NEAT_R model incorporate the same 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. At times, certain situations and sales may have higher or lower costs than the regional averages, based on site specific circumstances.

For example, in the Central Kupreanof project area, local estimates for logging costs may be lower for felling and bucking, shovel yarding, and hauling, while cable yarding costs may be estimated to be higher. Some of the reasons why local costs may be lower include: a nearby town (Kake) with an experienced and available workforce, a well developed Log Transfer Facility (LTF), and an existing road system.

Utility volume could be left in the woods under the optional removal contract provision. Additionally, in some years, public works funds are available to pay for all, or a portion of, NFS road construction or reconstruction costs in a timber sale for roads that will be used in the long-term administration of the national forest. Table 3-6 displays the stump to mill costs, indicated value and the advertised rate for each alternative if public work funds paid for all NFS roads construction or reconstruction costs.

Table 3-6. Timber Financial Efficiency Analysis (if public work funds cover NFS road construction costs).

	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Stump to Mill Cost $/MBF	$0	$368	$375	$348
Indicated Value ($ millions)	$0	($3.3)	($5.8)	($1.9)
Indicated Rate $/MBF	$0	($80.56)	($94.52)	($80.51)

Source: NEAT-R version 2.15 June, 2008 output

The mix of species harvested may also enhance the economic potential of the Central Kupreanof project area and may in turn affect the timber supply to the forest products industry. The amount of timber volume will have an effect on employment as shown in Table 3-7, which displays estimated direct employment that will result from logging and milling the volume in the timber sale.

Opportunities for Small Sales

Five individuals from Kake with small sawmills have contacted the Forest Service and expressed interest in purchasing small sales from the project area. The timber volume associated with the smaller units along the existing road system may be considered for small sale opportunities. Each of the three action alternatives include these small units and provide for numerous small sale opportunities from the project area. This may have a slight positive effect to the overall economics of the project as volume from small sales would likely be processed locally. Local processing avoids the cost of barging the timber to a larger mill, thus reducing logging costs and increasing the indicated bid amount for the volume harvested through small sales. Potential small sales however, would not change the project's estimated total volume, number of jobs, direct income, or logging systems by harvest method. Alternatives 2 and 3 would enhance opportunities as these alternatives propose new road access through suitable timber lands. This would open additional areas for future small sale projects currently not feasible for small operators; however, this future opportunity would have no effect on the timber economics for the Central Kupreanof Timber Harvest Project.

Opportunities for Microsales

Individuals from Kake have expressed interest in the Tongass Microsale program. For all action alternatives, Microsales would be allowed to occur along existing NFS roads 6040, 6314, 6314S, 6326, 6328, 6334, 6336, 6339 and 6367. Potential Microsales would not affect the logging costs, indicated bid amount, or logging systems by harvest method for the Central Kupreanof Timber Sale Project alternatives. Microsales would however, have the potential to slightly

increase the total volume, direct jobs, and direct income generated from the project.

Projects Common to all Action Alternatives

Also proposed are Projects Common to all Action Alternatives which may be implemented through stewardship contracts, further providing economic opportunity and benefiting local communities. The proposed projects include trail and cabin maintenance to meet current recreation use, manual invasive plant species control, wildlife enhancements, silviculture treatments, and regular road maintenance. Road storage or decommissioning is also a possibility for inclusion within a stewardship contract, as is the prioritization of pulling culverts. However, this is dependent on road management decisions analyzed and made in the ATM process. There would be no direct effects to timber sale economics. Indirect effects from using stewardship contracts may include an increase in employment and benefit local economies. Stewardship contracts also provide opportunities for potential timber sale operators to amortize costs over various contracts requiring similar skills. This could indirectly affect project logging costs and ultimately indicated bid values.

Projected Employment and Income

The action alternatives would have direct and indirect impacts to the economies of the local communities.

Direct employment and income likely to result from timber harvest is estimated by converting board feet to jobs and income. Table 3-7 displays estimated direct logging and sawmilling-related employment and income. Alternative 1 would not generate timber-related jobs since no timber would be sold.

Table 3-7. Estimated Project Employment and Income in Alaska

Employment[1]	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Logging[2]	0	91	136	55
Sawmills[3]	0	65-130	98-196	39-78
Direct Jobs	0	156-221	234-332	94-133
Direct Income ($ millions)	0	$6.1–8.3	$9.1–12.5	$3.6-5.0

Source: NEAT_R Version 2.15 June, 2008 output.
[1] Number of Job years
[2] Annualized jobs per MMBF based on net sawlog volume sold.
[3] Sawmill jobs range based on 50 percent of net volume shipped to markets outside Alaska to all sawlogs processed in Alaska

The number of sawmill jobs and related income is provided as a range in Table 3-7 to reflect the variety of options the timber purchaser has under the Limited Interstate Shipping Policy. The purchaser may elect to process all the sawlogs locally or to ship up to 50 percent of the total sawlog volume and 100 percent of the utility volume to markets outside Alaska in the lower 48 states. The Limited Interstate Shipping Policy allows shipment to the lower 48 states of unprocessed Sitka spruce and Western hemlock sawlogs smaller than 15 inches in diameter at the small end of a 40-foot log, and grade 3 or 4 logs of any diameter. 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 Alaska yellow-cedar.

The upper end of this range assumes all of the timber sold, including Alaska yellow-cedar is processed in Southeast Alaska. The lower end of this range assumes that the maximum of 50 percent of total sawlog volume is shipped to markets outside Alaska. The number of jobs and related income will likely fall somewhere between the high and low end of this calculated range, based upon factors such as current timber markets and mill configuration.

Other Employment Opportunities

Effects on other employment opportunities, such as those for tourism and commercial fishing are not included in the financial efficiency analysis. Because of the regional nature of these occupations, this analysis is done at the Forest planning level and is included in the analysis for the 2008 Forest Plan Amendment FEIS (USDA Forest Service 2008). Information on the effects to tourism and commercial outfitters and guides is found in the recreation section. Effects on the commercial fish species was done through the Essential Fish Habitat Assessment as required by the Magnuson/Stevens Fisheries Conservation Act (2000), found in the Fisheries section of the project record.

Indirect calculations are not included with this analysis. Robertson (2003) found that even in small communities where shifts in basic employment may be extreme, the economic base hypothesis (sometimes referred to as indirect job effects) is not supported by the empirical evidence. Linear indirect impact multipliers derived from modeling are, therefore, not applicable in small communities (Alexander, 2006). Effects on other employment opportunities, such as those for tourism and commercial fishing are not included in the financial efficiency analysis. Because of the regional nature of these occupations, this analysis is done at the Forest planning level and is included in the Forest Plan FEIS (January 2008).

Direct and Indirect Effects on Timber Economics Summarized by Alternative

Alternative 1

No timber income would be created from this project. Timber needed to meet the estimated demand would have to be harvested from other areas on the Tongass National Forest.

Alternative 2

This alternative would offer up to 46.8 MMBF of timber (sawlog and utility volume) for harvest. This alternative proposes the second highest volume of timber using ground based and helicopter logging systems. Alternative 2 would provide the Forest Service with less flexibility at the time of sale packaging than Alternative 3 given that fewer units and less volume would be available to offer for sale. However, Alternative 2 would provide more flexibility than Alternative 4.

The estimated logging and transportation costs would be $374 per MBF with road costs estimated to be $18.20 per MBF. The indicated bid is a negative $86.42 per MBF. Between 156 and 221 direct annualized jobs would be supported in Alaska, providing an estimated $6.1–8.3 million in direct income.

Alternative 3

This alternative would offer up to 70.2 MMBF of timber (sawlog and utility volume) for harvest. This alternative has the highest volume of timber. This alternative proposes harvesting all the units in the project unit pool. This alternative proposes helicopter yarding for those units where access by road construction is not feasible, otherwise ground based systems and associated road construction are analyzed for this alternative. Consequently, Alternative 3 proposes the greatest amount of NFS road and temporary road construction. Alternative 3 provides the Forest Service the most flexibility in sale packaging and the greatest ability to respond to future market conditions.

Estimated logging and transportation costs would be $410 per MBF with road costs estimated to be $47.79 per MBF. The indicated bid is a negative $129.16 per MBF. Between 234 and 332 direct annualized jobs would be supported in Alaska, providing an estimated $9.1 to 12.5 million in direct income.

Alternative 4

This alternative would offer 28.2 MMBF of timber (sawlog and utility volume) for harvest. Alternative 4 was developed in response to public concerns about the impacts of increased access, timber harvest, and road building on roadless area characteristics. This alternative proposes the lowest volume and the least flexibility in sale packaging. This alternative has the highest indicated bid under current market conditions, as it proposes only harvesting stands accessible from the

existing road system or temporary roads and avoids building new National Forest System roads and helicopter yarding.

Estimated logging and transportation costs would be $353 per MBF with road costs estimated to be $16.91 per MBF. The indicated bid is a negative $85.46 per MBF. Between 94 and 143 direct annualized jobs would be supported in Alaska, providing an estimated $3.6 to 5.0 million in direct income.

Table 3-8. Comparison of Alternatives

	Alt 1	Alt 2	Alt 3	Alt 4
Indicated Bid Value/MBF	0	($86.42)	($129.16)	($85.46)
Stump to Mill Cost $/MBF	0	$374	$410	$353
Road Costs/MBF	0	$18	$48	$17
Temp Road Miles	0	3.9	6.1	2.2
System Road Miles	0	7.3	25.1	0
Helicopter Sawlog Volume MMBF[1]	0	3.0	3.4	0
Ground Based Sawlog Volume MMBF[1]	0	36.4	55.6	23.6

[1] NEAT_R Version 2.15 June, 2008 Outputs. Total volume is slightly different then Table 3-5 due to rounding

Cumulative Effects on Timber Supply and Timber Economics

Economic effects are analyzed in the 1997 Forest Plan FEIS, 2003 Forest Plan SEIS, and most recently in the analysis for the 2008 Forest Plan Amendment FEIS. Alternatives 2 through 4 would contribute to the timber related economy of Southeast Alaska. Alternative 1 would not and timber from other areas on the Tongass would have to be used

to provide a supply. Presently, other timber sale projects in the vicinity include volume analyzed for the Kuiu Timber Sale EIS, the Scott Peak EIS, the Bohemia Mountain EIS, the Todahl Mountain EA, the 6367 Small Sale categorical Exclusion (CE) and the Kake Microsale I CE. Appendix A of the Central Kupreanof EIS includes information about how the Tongass timber program is structured.

Issue 2-

Inventoried Roadless Areas

Timber harvest and building roads in Inventoried Roadless Areas will reduce roadless acres within the project area and may affect roadless values.

Comments were received from the public concerning management of the inventoried roadless areas in the project area. Several comments expressed the desire to avoid roads and harvest in Tongass inventoried roadless areas because of the potential to affect their roadless characteristics and size. The Central Kupreanof project area includes portions of four inventoried roadless areas: North Kupreanof, South Kupreanof, Rocky Pass and Castle Inventoried Roadless Areas (See Figure 3-1).

Units of Measure:

- Acres of timber harvest and miles of new NFS and temporary road construction, total affected acres, and percent of IRA affected, including the 600-foot and 1,200-foot buffers.
- Relative change in the roadless characteristics of each individual IRA.

Inventoried roadless areas are undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for wilderness consideration under the Wilderness Act. Although these areas are not currently under consideration for wilderness designation, they contain values that may include pristine watersheds, diversity of native plant and animal communities, habitat for threatened, endangered or sensitive species, primitive and remote recreational opportunities, scenic values, cultural or historic features, unique wetlands or geologic formations, or highly valued subsistence opportunities. Because 81% of the project area is comprised of inventoried roadless areas, these values are included in the general description and characterization of the project area, and evaluated in individual resource reports (see Wildlife, Subsistence, Watershed, Fisheries, Soils and Geology, Heritage, Scenery, and Recreation reports). This section in the EIS specifically considers the relative change to these values for each inventoried roadless area potentially affected by the Central Kupreanof project.

Regulatory Framework

The Roadless Area Conservation Rule (January 2001) has been the subject of numerous lawsuits. Courts have simultaneously upheld and overturned the 2001 Roadless area Conservation Rule. On May 28, 2009, the USDA Secretary reserved decision making authority over construction and reconstruction of roads and the cutting, sale or removal of timber in inventoried roadless area (in a memorandum that stated):

"The authority to approve road construction and timber harvest in Inventoried Roadless Areas is reserved to the Secretary of Agriculture (Secretary's Memorandum 1042-154)."

The Secretary's Memorandum is intended to ensure the careful consideration of activities in Inventoried Roadless Areas while long term roadless policy is developed.

During the analysis conducted in the 2008 Forest Plan Amendment, protection of high value roadless areas were identified as a key issue that drove development of alternatives and focused the effects analysis. The issue responded to the protection of high value inventoried roadless areas from road development and timber harvest, particularly for wildlife, biodiversity, recreation, and tourism. The Tongass National Forest is currently more than 90 percent roadless, including Wilderness. Seeing a balance between the protection of inventoried roadless areas (deemed to have high qualitative value), and timber market demand in the 2008 Forest Plan development of Alternatives, the Record of Decision selected Alternative 6. Alternative 6 retains 76% of the roadless acreage in natural setting Land Use Designations (LUDs) and allows 3.2% suitable for timber harvest.

As an additional step, the 2008 Forest Plan incorporated the Timber Sale Program Adaptive Management Strategy in response to concerns that an overestimate of timber demand would lead to timber harvest in areas perceived by many as more environmentally sensitive, such as higher value Inventoried Roadless Areas, that would not have to be developed if the Plan were based on a lower estimate of timber demand (See Forest Plan, Record of Decision, page 17, and pages 37-43).

All of the IRA acres within the Central Kupreanof project area have been identified to be within the Phase 1 suitable land base.

Resource Analysis Area

Portions of four IRAs are within the project area. For each IRA, the entire IRA is included within the resource analysis area for effects.

Affected Environment

Reference Condition

In the evaluation of inventoried roadless areas in the 2003 Forest Plan SEIS, all Tongass National Forest lands were assessed to determine if they were suitable for wilderness based on the Wilderness Act and the procedures in the Forest Service planning directives. Appendix C (2003 Forest Plan SEIS Volumes II and III) includes documentation of the analysis and evaluation for each roadless area, describing qualitative resource attributes and the relative contribution each roadless area would make to the National Wilderness Preservation System. These characteristics included the wilderness potential or wildernesses attribute rating (WARS), the opportunity for solitude and serenity, scenic value, recreational values, ecologic values, cultural or historic values, and research values. Characterization and values of the IRAs in the project area were reviewed. There is no new information or changes to update the IRA descriptions. These descriptions serve as the reference condition and will be used in this analysis to describe the degree of change that would occur by the implementation of the Central Kupreanof EIS to the affected Inventoried Roadless Areas.

Table 3-9. 2008 Forest Plan Development and Non-development LUD allocation for project area Inventoried Roadless Area

Roadless Area	Roadless Area number	Non-development LUD Acres	Development LUD Acres	Total acres in Roadless Area
North Kupreanof	211	53,107	46,456	99,566
South Kupreanof	214	48,060	165,067	213,122
Rocky Pass	243	73,181	5,921	79,103
Castle	215	29,815	22,621	52,432
Total Acres		**204,163**	**240,065**	**444,223**

[1] Total acres are from the 2003 SEIS. Addition of non-development and development LUD acres do not equal total SEIS acres due to slivers resulting from unmatching shorelines in GIS layers.

Existing Condition

North Kupreanof Inventoried Roadless Area

The North Kupreanof Inventoried Roadless Area (99,566 acres) is located at the north end of Kupreanof Island and lies along the southern shore of Frederick Sound. Approximately 29,054 acres of this inventoried roadless area are within the project area.

North Kupreanof Inventoried Roadless Area is generally characterized by uniformly rolling lowlands with considerable muskeg. The Bohemia Range rises to an elevation of over 2,200 feet to the east, providing topographic relief to essentially flat terrain. Three major drainage systems, Hamilton Creek, Big Creek and Cathedral Falls Creek, wind across much of the area. There are also many small lakes.

The area is mostly unmodified; however, it is influenced by development on the east and west sides, as well as by two roads which nearly divide the area. The overall area has moderate natural integrity and relatively high apparent naturalness. None of the landscape in the area is considered distinctive for the character type from a scenery standpoint. While a small portion of this roadless area located in Hamilton Creek drainage is part of the Kake Municipal Watershed, this area is outside of the project boundary. Also, the small area of karst near Hamilton Creek north of Towers Lake lies outside of the project boundary.

The North Kupreanof IRA is influenced by development on the east and west sides, as well as by roads which nearly divide the roadless area. The area was rated 19 out of a possible 28 points using the Wilderness Attribute Rating System (WARS) (SEIS 2003) and ranked 70th along with 13 other Tongass inventoried roadless areas.

South Kupreanof Inventoried Roadless Area

The South Kupreanof Inventoried Roadless Area (213,122 acres) occupies most of the southern half of Kupreanof Island. Approximately 93,804 acres of this inventoried roadless area are within the project area.

Landforms in this area are characterized by uniformly rolling to moderately-steep hills, typically less than 1,500 feet in elevation, though some peaks are over 2,000 feet. The ridges parallel each other in a roughly northwest to southeast direction. The area contains approximately 107 miles of shoreline on saltwater.

This relatively large roadless area is mostly unmodified and natural appearing. However, the extension of the road system from the north influences the area to some degree. The natural integrity and apparent naturalness are rated very high. None of the area is rated as distinctive for the character type from a scenery perspective. There is a small area of karst north of Taylor Creek along the shore of Towers Arm. Stone

columns comprised of columnar basalt form the "totems" at the head of Totem Bay, outside of the project area.

The South Kupreanof IRA has an existing road corridor extending halfway through the interior and partially into the upper Castle River watershed. The southern half of this area is predominantly unmodified and undeveloped. The area was rated 24 out of a possible 28 points using WARS and ranked 24th along with 4 other Tongass inventoried roadless areas among the 109 on the forest.

Rocky Pass Inventoried Roadless Area

Rocky Pass Inventoried Roadless Area (79,103 acres) includes many small islands and is divided into two portions separated by the Rocky Pass saltwater channel. The western portion lies on the eastern edge of Kuiu Island, and the eastern portion lies on the western edge of Kupreanof Island, just south of Kake. Approximately 251 acres of this inventoried roadless area are within the project area boundary.

Landforms within this area are characterized by rolling to moderately steep hills, typically less than 1,500 feet in elevation. The roadless area is bordered to the west by the Camden Inventoried Roadless Area, and South Kupreanof Inventoried Roadless Area to the east.

The area is natural appearing. The natural integrity is very high and the apparent naturalness is outstanding. Approximately nine percent of the landscape is considered distinctive for the character type from a scenery standpoint. This area has very high cultural, historic, and recreational values. The area is prized for its geologic diversity and is a prime area for rock hounds to visit. These unique features of the Rocky Pass Inventoried Roadless Area are located outside of the Central Kupreanof project area boundary.

The Rocky Pass IRA, especially the southern half, is predominantly unmodified and undeveloped. The area was rated 26 out of a possible 28 points using WARS and ranked 5th along with 6 other Tongass inventoried roadless areas.

Castle Inventoried Roadless Area

Castle Inventoried Roadless Area (52,432 acres) lies along the southwest shore of Duncan Canal in the southeast corner of the main lobe of Kupreanof Island. It is mostly northwest of Kah Sheets Bay and includes Castle River estuary and flats, and the lower 1/3 of the watershed. The roadless area also includes the Castle Islands in Duncan Canal, Kah Sheets and Lung Islands in Kah Sheets Bay, the Level Islands south of Kah Sheets Bay, and several other small islands.

The area is mostly unmodified; however, some of the shoreline along Kah Sheets Bay and areas along Little Duncan Bay are outside the roadless area boundary due to the presence of roads constructed for

timber management in the mid 1970s. The older harvested areas are mostly natural appearing as they mature.

The Castle River IRA was rated 25 out of a possible 28 points using WARS and ranked 12th along with 12 other Tongass inventoried roadless areas.

Approximately 188 acres of the IRA are within the project boundary; however, there are no proposed or reasonably foreseeable future activities within this roadless area. Therefore this inventoried roadless area will not be discussed further.

Environmental Consequences

Methods

The 2003 Forest Plan SEIS GIS layer as incorporated by the 2008 Forest Plan reflects the best and most current information for the Tongass inventoried roadless areas and was used for summarizing the information required for the analysis. No changes have been made to these roadless area boundaries or values since the 2003 Forest Plan SEIS inventory. The analysis boundary for direct and indirect effects includes the entire North Kupreanof, South Kupreanof, and Rocky Pass Inventoried Roadless Areas.

Effects will be measured by acres of harvest and miles of road construction within roadless area boundaries as well as total acres affected by proposed activities. Total acres affected will include the 600-foot buffer around harvest units and 1,200-foot buffer placed around roads (2003 Forest Plan SEIS). For the 2003 Forest Plan SEIS inventory, helicopter logged units that were not adjacent to a road or associated cable unit were included as part of the inventoried roadless areas. In accordance, all helicopter units for this project will not receive the 600-foot zone of influence buffer (2008 FEIS, p. 3-443).

Direct and Indirect Effects of the Alternatives

Effects Common to all Action Alternatives

This analysis does consider that helicopter logging will influence roadless characteristics. Effects to wildlife and other resources in helicopter units would be less than clearcut units since 60 percent of the stand will remain after harvest. Temporary roads and NFS roads were given the same buffer (1,200 feet) and are similarly treated in this analysis although temporary and closed system roads may have a lower degree of influence on wildlife, watershed and recreation resources after the timber harvest is complete. Temporary roads in particular will continue having a diminishing effect on inventoried roadless areas over time as natural revegetation and water drainage are established.

In all action alternatives, the majority of effect to the IRA size is created by the 600-foot buffer and 1200-foot buffer around harvest acres and roads. These buffers were used by the Roadless Area Inventories in the 2003 SEIS and in the update of effects in the 2008 Forest Plan amendment to account for the influence of harvest and roads. This analysis shows the main reduction is from these buffers and indirect effects to IRAs.

While the overall roadless characteristic of each inventoried roadless area would remain unchanged, individually identified roadless values would either remain unchanged or be minimally influenced by the proposed activities. Soil, water and air quality would remain unchanged. There would be no effect to public drinking water. Each roadless area would still be able to support a diversity of plant and animal communities and provide habitat for sensitive species (no threatened or endangered species exist within the project area). While there may be some change, all areas would continue to provide for a variety of recreation experiences including primitive, semi-primitive non-motorized and semi-primitive motorized classes. All inventoried roadless areas would still provide large areas in natural settings that could serve as reference landscapes. While there would be limited visible changes to the inventoried roadless areas, overall scenic qualities would not change. No traditional or cultural properties or sacred sites would be affected by the proposed activities. No Attractions or Features of Special Interest (as identified in the Forest Plan SEIS) would be affected by the implementation of any action alternative.

In all alternatives, the North Kupreanof, South Kupreanof, and Rocky Pass Inventoried Roadless Areas would remain greater than 5,000 acres in size and eligible for Wilderness consideration in subsequent forest planning. Areas are rated using the Wilderness Attribute Rating System (WARS). WARS ratings for each inventoried roadless area are not expected to change with implementation of any alternative.

Comparison of Alternatives

Alternatives 2 and 3 include timber harvest within the boundaries of the North Kupreanof, South Kupreanof, and Rocky Pass Inventoried Roadless Areas. The predominant effect would be to the South Kupreanof Roadless Area with approximately 341 acres of timber harvest and one mile of new NFS road in Alternative 2 and the harvest of 1,184 acres and 15 miles of road construction in Alternative 3. In comparison, the North Kupreanof Inventoried Roadless Area acres of harvest would vary from 90 acres in Alternative 2 to 152 acres in Alternative 3. No new roads are proposed within the North Kupreanof or Rocky Pass Inventoried Roadless Areas. Both Alternative 2 and 3

propose three acres of timber harvest within the Rocky Pass Inventoried Roadless Area.

Of the three action alternatives, Alternative 3 affects the most total roadless acres. Up to 5,273 acres would be treated as developed in the South Kupreanof Inventoried Roadless Area. The affected acres represent about two percent of the South Kupreanof Inventoried Roadless Area.

Alternative 4 avoids timber harvest and road building within the boundary of inventoried roadless areas. However, the application of the 600 feet and 1,200 feet around harvest units and roads would spill into the inventoried roadless area boundaries. Alternative 4 affects the least total roadless acres of any action alternative.

Tables 3-10 through 3-12 display the effects to inventoried roadless areas by Alternative.

Alternative 1

This alternative does not propose road construction or timber harvest and would have no effect on any inventoried roadless areas.

Alternative 2

In the North Kupreanof Inventoried Roadless Area, timber harvest would total approximately 90 acres, with no NFS or temporary road construction. Unit 216 would total approximately 32 acres of harvest by single tree selection and helicopter yarding. Harvest proposed by clearcut methods and conventional yarding include Units 215 and 903, totaling approximately 58 acres. Approximately 294 total roadless acres (0.3%) would be affected with the 600 foot delineation around harvest units.

Alternative 2 proposes approximately 341 acres of timber harvest and one mile of NFS road construction in the South Kupreanof Inventoried Roadless Area. Units 218, 219, 222, 223, 224, 232, 233, 234, 235, and 249 would remove approximately 211 acres by single tree selection and helicopter yarding. Harvest proposed by clearcut methods and conventional yarding include Units 250, 252, 253, 270, 282, 284, and 285, which total approximately 130 acres. Approximately 881 total acres (0.4%) would be affected with application of the 600 feet around harvest units and 1200 feet for road construction.

Approximately three acres of timber harvest (Unit 310 by clearcut methods) is proposed in the Rocky Pass IRA. No road construction would occur inside the Inventoried Roadless Area boundary. A total of approximately 80 acres (0.1%) would be affected.

For all Inventoried Roadless Areas in Alternative 2, the characteristic values for availability as wilderness would remain unchanged. No unique attributes would be affected. The biological value of old-growth forest would be reduced proportionally by the amount of timber harvest in each inventoried roadless area. The scenic

conditions to the Rocky Pass Inventoried Roadless Area would only be slightly changed by timber harvest activities outside the Inventoried Roadless Area.

Alternative 3

Alternative 3 proposes approximately 152 acres of timber harvest and no road building within the North Kupreanof Inventoried Roadless Area. Approximately 32 acres (Unit 216) of harvest would be by single tree selection and helicopter yarding. Harvest proposed by clearcut methods and conventional yarding include Units 215 and 903, totaling approximately 58 acres. Approximately 356 total acres (0.4%) would be affected.

Alternative 3 proposes about 1,184 acres of timber harvest, 13 miles of NFS road, and two miles of temporary road within the South Kupreanof Inventoried Roadless Area. All or portions of Units 218, 219, 221, 222, 223, 224, 232, 233, 234, 235, 236, 239, 241, 243, 246, 248, 249, 250, 252, 253, 254, 257, 258, 260, 261, 262, 263, 264, 265, 266, 267, 268, 270, 272, 274, 275, 276, 277, 279, 280, 281, 282, 284, 285, and 286 would be within the roadless area. Approximately 5,273 total acres (2.4%) would be affected with application of the 600-foot and 1,200-foot around harvest units and roads.

Under Alternative 3, the Rocky Pass roadless area would be affected by the three acres of timber harvest proposed in Unit 310 by clearcut methods. No road construction would occur inside the inventoried roadless area boundary. Approximately 80 total acres (0.1%) would be affected.

For all inventoried roadless areas in Alternative 3, the characteristic values for availability as wilderness would remain unchanged. The biological value of old-growth forest would be reduced proportionally by the amount of timber harvest in each roadless area. The scenic conditions to the Rocky Pass Roadless Area would only be slightly changed by timber harvest activities outside the Inventoried Roadless Area.

Alternative 4

Alternative 4 proposes no timber harvest or road building within the North Kupreanof, South Kupreanof, or Rocky Pass Inventoried Roadless Areas. However, when the 600-foot and the 1,200-foot buffers are applied to harvest units and roads proposed outside and adjacent to the inventoried roadless areas, the Inventoried Roadless Areas would be influenced by proposed activities. Total acres affected would include 24 acres (0.02%) in the North Kupreanof Inventoried Roadless Area, 103 acres (0.04%) in the South Kupreanof Inventoried Roadless Area, and 13 acres (0.01%) in the Rocky Pass Inventoried Roadless Area.

For all inventoried roadless areas in Alternative 4, the characteristic values for availability as wilderness would remain unchanged. No

unique attributes would be affected. The biological value of old-growth forest would not be reduced as no timber harvest would occur within any Inventoried Roadless Area.

Table 3-10. North Kupreanof Inventoried Roadless Area(99,566)

Measure of Direct and Indirect Effects By Alternative	1	2	3	4
Acres of timber harvest	0	90	152	0
Miles of NFS roads (closed after harvest)	0	0	0	0
Miles of temporary roads (decommissioned after harvest)	0	0	0	0
Total acres affected including buffers (600' for harvest units, 1200' for roads)[1]	0	294	356	24
Percent of North Kupreanof Roadless Area affected	**0%**	**0.3%**	**0.4%**	**0.02%**

[1] Helicopter units do not receive buffers.

Table 3-11. South Kupreanof Inventoried Roadless Area (213,122 acres)

Measure of Direct and Indirect Effects By Alternative	1	2	3	4
Acres of timber harvest	0	341	1,184	0
Miles of NFS roads (closed after harvest)	0	1	13	0
Miles of temporary roads (decommissioned after harvest)	0	0	2	0
Total acres affected including buffers (600' for harvest units, 1200' for roads)[1]	0	881	5,273	103
Percent of South Kupreanof Roadless Area affected	**0%**	**0.4%**	**2.4%**	**0.04%**

[1] Helicopter units do not receive buffers.

Table 3-12. Rocky Pass Inventoried Roadless Area

Measure of Direct and Indirect Effects By Alternative	1	2	3	4
Acres of timber harvest	0	3	3	0
Miles of NFS roads (would be closed after harvest)	0	0	0	0
Miles of temporary roads (would be closed after harvest)	0	0	0	0
Total acres affected including buffers (600' for harvest units, 1200' for roads)[1]	0	80	80	13
Percent of Rocky Pass Inventoried Roadless Area affected	**0%**	**0.1%**	**0.1%**	**0.01%**

[1] Helicopter units do not receive buffers.

Direct and Indirect Effects of Associated Timber Harvest Activities

Utilization of the existing Little Hamilton LTF for log transfer, storage, and camp operations would have no direct effects as they occur outside inventoried roadless area boundaries. However, use of the LTF, across the bay from Rocky Pass Inventoried Roadless Area would indirectly affect users as water traffic in the Hamilton Bay and mouth of Rocky Pass would temporarily increase (although logging traffic would most likely avoid the shallow waters of the Rocky Pass). Sights and sounds of logging operations would also temporarily affect roadless recreation in the adjacent portion of the roadless area. Effects from other ground disturbing activities necessary to implement the Central Kupreanof project such as rock pit development are included in the footprint and total effect of road construction.

Cumulative Effects

The cumulative effects analysis boundary for Inventoried Roadless Areas includes the entire inventoried roadless area both inside and outside of the project area, since any effect outside the project area may have the potential to reduce the size of the roadless area and represent a cumulative effect. The Catalog of Events for Kupreanof Island was referenced in determining cumulative effects.

The Petersburg Ranger District is currently analyzing Access Travel Management. Road management decisions will become part of the District's Motor Vehicle Use Map to be published in 2009. Road closures adjacent to roadless area boundaries would influence the quality of the North Kupreanof, South Kupreanof, and Rocky Pass Inventoried Roadless Areas by reducing the adjacent sights and sounds of vehicle traffic at current levels while roads remain closed.

Harvest of the remaining NEPA cleared units from the Bohemia Mountain ROD will harvest an additional 58 acres within the North Kupreanof Roadless Area. With delineation of the 600 feet and 1,200 feet, total acres affected would be about 104, or about 0.1%. Total cumulative effects to the North Kupreanof IRA would range from 0.1% with the No Action Alternative up to 0.5% with Alternative 3. Remaining units from Shamrock EIS have been incorporated into the Central Kupreanof unit pool and would not be harvested separately.

Cumulative effects on inventoried roadless areas were reanalyzed in the 2008 Forest Plan Amendment. During this analysis for the Forest, the unique characteristics and values of the inventoried roadless areas, their location, and proximity to other inventoried roadless areas, especially Congressionally-designated Wilderness Areas, were evaluated. To determine the final allocations for development, in the Selected Alternative of the Record of Decision, decisions were made based on the specific factors and characteristics listed above.

There are currently 9.6 million acres of land that are considered inventoried roadless areas on the Tongass National Forest. Even with full implementation of activities allowed under the 2008 Forest Plan Amendment and no further Wilderness designation, 80 percent of the Tongass would remain in an undeveloped condition without roads after 100 years. None of the alternatives for the Central Kupreanof Timber Harvest project would affect the future Wilderness eligibility of any affected inventoried roadless area after implementation.

It is reasonable to assume that timber harvest and associated road management will continue on Kupreanof Island. Although in all alternatives for the Central Kupreanof Timber Harvest project roads affecting inventoried roadless areas will be closed within ten years after the completion of timber harvest activities, it is intended these roads will be used and additional roads be planned for future access to the suitable timber within inventoried roadless areas.

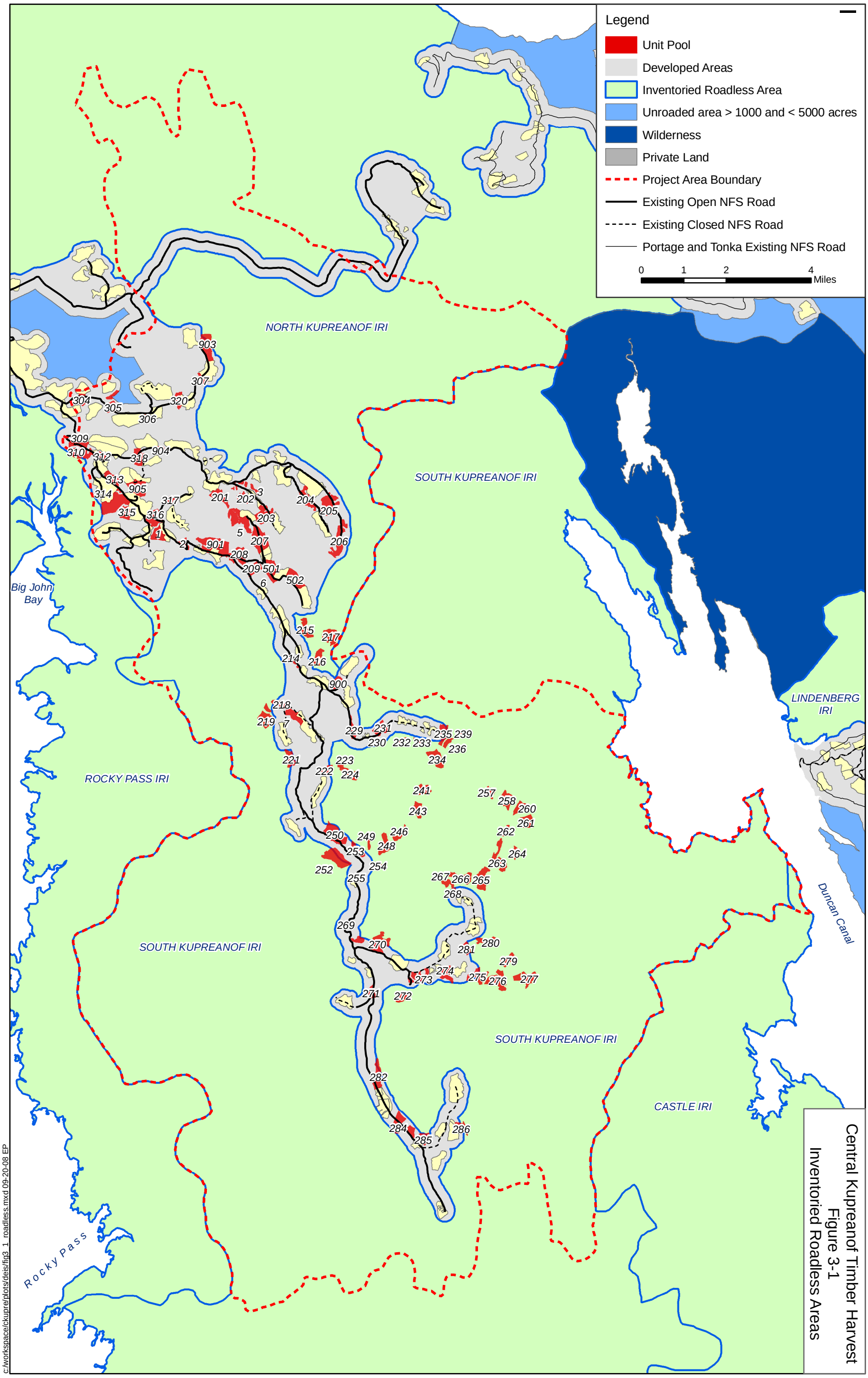
Since timber harvest and associated road building and major facilities are not allowed within non-development LUDs, a considerable portion of the inventoried roadless areas on Kupreanof Island would remain in a natural state for the life of the Forest Plan.

Effects of Projects Common to all Action Alternatives

The Big John Trail and Cabin are located with the Rocky Pass Inventoried Roadless Area. Maintenance of these recreation facilities would continue to enhance the current recreation experience; however, because these are existing developed recreation facilities and maintenance will occur within the existing footprint, no additional direct or indirect effects are expected to the roadless area. Opportunities to pull or replace red fish crossings are dependent on decisions made in the District ATM process; however any road closures adjacent to roadless area boundaries would influence the quality of the North Kupreanof, South Kupreanof, and Rocky Pass Inventoried Roadless Areas by reducing the adjacent sights and sounds of vehicle traffic from current levels while roads remain closed. There would be no other direct, indirect or cumulative effects from the Projects Common to all Action Alternatives as none of these activities enter into Inventoried Roadless Area boundaries or influence their roadless characteristics.

There would be no significant effect from a Microsales program to inventoried roadless areas as these activities would occur on existing NFS roads open for long term management.

3 Environment and Effects



Central Kupreanof Timber Harvest
Figure 3-1
Inventoried Roadless Areas

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Issue 3-

Road Management/Access

The construction, reconstruction and use of forest roads associated with the Central Kupreanof Timber Harvest may change access within the project area.

Roads influence wildlife populations, water quality, subsistence use, the type of recreational opportunities available and the ability to maintain open roads. Comments ranged from requesting no more new roads, closure of most existing roads, and requests to increase access by new roads and opening more existing roads. This analysis considers the effects of the new construction and reconstruction of roads used to access the proposed timber harvest. It will also analyze the status of these roads after timber harvest (open or close).

National Forest System (NFS) roads are constructed to provide access to NFS lands (Transportation Standards and Guidelines in Chapter 4 of the Forest Plan). They are considered NFS roads as are other roads that are wholly or partially on NFS lands and are intended to be maintained for the long term (see Chapter 4 for a glossary with transportation terms). Most forest roads are single lane, constructed with blasted quarry rock, and designed for off-highway loads.

For the Tongass, the demand for roads has primarily been a function of the demand for access to timber resources. The maintenance and reconstruction requirements of the existing system depend mainly on the volume of timber hauled and, to a lesser extent, on recreational use. Road maintenance consists of 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. The amount of future construction is anticipated to be largely determined by the need to access timber resources.

Roads have the potential to affect fish habitat, soils, and water quality by increasing erosion and landslide potential, changing recreation settings and opportunities, altering scenery, and increasing wildlife harvest. These types of effects are discussed in the subject resource sections.

Units of Measure

- Miles of new NFS road constructed
- Miles of temporary road construction
- Miles of reconstructed NFS road
- Miles of road to remain open to motorized vehicle traffic
- Miles of road to be closed associated with this timber harvest project
- Miles of new NFS and temporary road construction in inventoried roadless areas
- Cost including maintenance of open roads, reconstruction, and new (NFS and temporary) road construction

Affected Environment for Roads

The existing roads in the Central Kupreanof project area are connected to a contiguous road system consisting of approximately 114 miles of NFS roads on the northern portion of Kupreanof Island known as the Kake Road System. There are approximately 79 miles of existing NFS roads within the Project Area, 64 miles are currently open to motorized vehicles (see Table 3-15). All roads within the project area fall under Forest Service jurisdiction.

NFS roads were constructed as part of previous timber sale contracts for the purpose of timber haul and administration. Most of the road use on the island is administrative, logging traffic or because of the proximity of the Kake, by the public. Traffic is primarily seasonal. Roads are usually closed December thru April by snow.

Project area roads may be accessed from the community of Kake by NFS Road 6040 or from the existing Log Transfer Facility (LTF) at Little Hamilton Bay. NFS roads 6000, 45006, portions of 6030 and 6040 are not located within the Central Kupreanof project area, but would be used by administrative traffic, and for the transport of harvested timber.

Kupreanof Island's transportation system is accessible by the Alaska Marine Highway. An additional road system, operated by local Alaska Native Corporations, connects to the city of Kake.

NFS Road

An NFS road is "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 are generally required to provide long-term or intermittent motor vehicle access.

These roads receive constant or intermittent use depending upon the timing of the timber harvest(s) and other activities. NFS roads form the primary transportation network in the project area. NFS roads have in the past been referred to as "Forest Development Roads," "classified," "system" roads, or "specified" roads.

Unauthorized Road

Unauthorized roads include unplanned roads, abandoned travel ways, and off-road vehicle tracks that have not been designated and managed as a trail. Roads that are no longer under permit or other authorization and have not been decommissioned are also considered unauthorized.

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 by removing culverts and bridges after a timber harvest. Temporary roads have also been called "spur" roads.

Road Decommissioning

Road decommissioning activities result in the stabilization and restoration of unneeded roads (in the long-term) 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 revegetated. Decommissioning can occur for all three types of roads. For NFS roads, decommissioning removes the road from the long-term forest road transportation system. Otherwise, the act of decommissioning is the same for all roads. Action on the ground for decommissioning ranges from blocking the entrance and removing drainage structures to obliterating the road, returning the natural contours, and replanting vegetation. The end result is the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1).

Road

A road is a motor vehicle travel way over 50 inches wide, unless National Forest System and managed as a trail. A road may be National Forest System, unauthorized, or temporary (36 CFR 212.1).

Table 3-13. Miles of Road by Maintenance Levels

Miles of Road By Maintenance Level	1- Basic Custodial Care	2- High Clearance Vehicles	3- Suitable for Passenger Cars	Total Miles
Project Area NFS Road	14.7	32.7	31.7	79.1
NFS Roads Outside Project Area Used For Haul to LTF	0	1.3	6.1	7.4
Decommissioned Former Temporary Roads Miles				**10.1**

Rock Quarries

There is a need for a rock source for the construction of new NFS and temporary roads, and the reconstruction, and maintenance of the existing NFS roads in this project. It is preferred that the rock source is close to the site of road construction or maintenance, usually within two miles is best.

There are numerous rock quarries throughout the project area and usually there is one within a few miles of the proposed site. The easy accessibility of existing rock quarries may eliminate the need to develop some new rock quarries. Existing rock quarries in the project area that are available for future expansion and use are shown on Figure B-1.

New rock quarries may be developed to support new road construction and road maintenance. Quarry sites would be developed within 500 feet of a road and avoid Class I and Class II stream buffers, and eagle and goshawk nest tree buffers. With either the expansion of an existing quarry or the development of a new site, the area footprint would not exceed five acres.

Log Transfer Facility (LTF)

The transfer of harvested timber requires that logs be hauled directly to mills by trucks, or removed from trucks, transferred to salt water then towed to a mill by barge. The existing permitted LTF is located in Hamilton Bay. Approximately 4 miles outside of the Central Kupreanof project area, Little Hamilton LTF is a steel piling and concrete dock facility. The permit allows for both rafting or barging of logs.

Hamilton Bay was placed on the 1996 Section 303 (d) list for debris. Past dive surveys had indicated that excessive bark existed on the

bottom of Hamilton Bay as a result of logging operations on Kupreanof Island that used the Hamilton Bay log transfer facility. Dive survey reports from September 2000 and June 2002 of 0.6 acre coverage document that this water is compliant with standards. This water was removed from the Section 303 (d) list in 2002/2003.

Sort Yard

All action alternatives would use the sort yard adjacent to the Little Hamilton LTF. This sort yard is approximately 2 ½ acres in size located next to the LTF on Road 6000. Presently the sort yard is in good condition with a clean surface of rock aggregate.

Logging Camp

No land camp is proposed in the project area for any of the alternatives. National Forest Lands across from the Kake administrative facility have been used as a logging camp in the past. A special use permit would have to be approved before this site could be used. The town of Kake or a floating camp could be used during harvest activities. Appropriate permits would need to be acquired by the operator for use of a floating camp.

Forest Service Facilities

There are no Forest Service administrative sites in the Project Area. The Kake administration site is located approximately 9 miles northwest of the Project Area Boundary.

Roads Analysis Process

The desired condition for the forest transportation system is guided in part by 36 CFR 212.5 - Road System Management. Part b provides guidance for determining the minimum road system needed. Among other direction, the Roads Rule requires that an area-specific roads analysis be completed and a determination of need for amendment or revision of the Forest Plan be made if any roads are to be constructed or reconstructed in inventoried roadless or contiguous unroaded areas, until forest-wide roads analysis has been completed (FSM 7712.16(c)). No amendment would be required to the Forest Plan with implementation of any alternative.

For the Central Kupreanof project area, “The Kake Road Analysis Report” was completed in September 2000 for the Kake area. Analyzing this area is a logical unit since the road system is not connected to any other island or the mainland, except by water or air transportation. In April 2008, this road analysis was updated by the Central Kupreanof Inter-Disciplinary team (ID Team). The Road Analysis Process (RAP) for the Kake Road System is a science-based system of analysis and tiered to the Tongass Forest-wide RAP (USDA Forest Service 2003).

The Kake Road System RAP consists of a report and accompanying maps and tabular information located in the Central Kupreanof project record. While this road analysis does not contain any road management decisions, it does make recommendations for road management objectives (RMOs). For those roads associated with

proposed timber harvest activities, the recommendations have been analyzed in this EIS and decisions for those roads will be made in the Record of Decision. New and reconstructed roads that remain open for interim public use will be designated as such on the District Motor Vehicle use Map (MVUM). Subsequent closures of these roads pursuant to ANILCA Section 811 (b) will be incorporated into the annual review of the MVUM, during the year in which the closure takes effect. Recommendations for roads not used with this timber sale proposal will be carried forward and analyzed in the District's Access Travel Management EA.

Methods

The analysis area for the transportation system includes the project area and road segments leading into the project area. Information sources for transportation analysis include the transportation GIS records which house the spatial data for road locations. An inventory of road attributes for NFS roads is maintained on National Forest through the I-Web database. A complete list of road attributes and definitions of these attributes is located in the project record. Forest Service personnel have conducted road condition surveys on many of the existing roads in the project area. These surveys supply site specific detailed information about each road (and section of road) surveyed, including:

- Whether the road, or a particular section of the road, is drivable;
- Number, size, and condition of drainage structures and bridges;
- Barriers to vehicle access (e.g., vegetation, barrier ditches, pulled bridges, slides);
- Maintenance requirements; and
- Barriers to fish passage through road drainage structures

Proposed new road location corridors are planned using aerial photo interpretation and GIS layers (including topography, streams, vegetation and soils) and field investigations, to access proposed units. Some, but not all, of the primary concerns include: minimizing rock excavation, selecting stable stream crossings, minimizing the traverse of steep slopes, avoiding areas of unstable soils and wetlands, minimizing impacts within riparian areas, and avoiding wildlife buffers. The intent is to select a location that balances acceptable environmental impact with the lowest construction and maintenance costs.

Areas of concern on new road construction routes are field reviewed by resource specialists. Field information such as specific comments and concerns along with site-specific mitigation measures are incorporated into the respective resource analysis and reports as well as into the design criteria on the road cards (Appendix B). Cumulative effects are discussed jointly at the end of the direct and indirect effects analysis for alternatives. All road mileage is approximate.

Environmental Consequences and Effects Common to all Action Alternatives

The effects of roads and access management on resources are discussed in their respective resource sections and reports. Site specific design criteria can be found on the road cards.

Under alternatives 2, 3, and 4, road maintenance would occur on roads used for timber haul associated with this project. Maintenance activities could include road grading, brushing, ditch cleaning, and culvert cleaning. Other repairs would take place during timber haul operations on an as needed basis.

All road construction would follow the applicable BMPs and meet or exceed Forest Plan Standards and Guidelines.

Road Maintenance

The amount and level of maintenance and repair is dependent upon traffic management objectives and maintenance criteria. Road reconditioning is heavier maintenance on an existing road such as culvert replacement, surface rock replacement, and subgrade repair.

Road reconstruction is an activity that results in improvement or realignment of an existing National Forest System road. Road improvement results in an increase of an existing road's traffic service level, expansion of its capacity, or a change in its original design function. Road realignment results in a new location of an existing road or portions of an existing road and treatment of the old roadway (36 CFR 212.1).

Maintenance of existing NFS roads is an ongoing process that occurs on a periodic basis. Normally this kind 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 of NFS roads in 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, comply with best management practices, maintain the existing infrastructure for the proposed timber sale or any

future harvest entries, and other National Forest management activities. The timing of this work may coincide with this project's analysis but is not part of the proposed action or alternatives being considered. Any effects from the road maintenance work are included in the cumulative effects analysis for this project.

Proposed New Roads

In addition to using the existing roads, some new NFS and temporary road construction would be needed to access harvest units within the project area for silvicultural activities. All new construction would be off of the existing road system. All newly constructed NFS road will be managed as a maintenance level 2, open to motorized vehicle traffic, during timber sale activities. These roads would be either constructed in a self maintaining hydrological status, or after completion of the timber sale activities, be placed in a self-maintaining hydrologic status. They may remain open an additional five to ten years for other activities such as regeneration surveys and firewood removal. This would include the placement of drivable water bars or dips at all drainage culvert locations to direct water across the road in event that the culvert becomes blocked. Other design elements like oversized culverts may be used to help reduce the need for routine drainage maintenance.

All newly constructed NFS roads would be intermittent service roads (maintenance level one) within ten years and would be physically blocked, or natural vegetation allowed to eliminate motorized access. Drainage structures would remain in place with additional cross drains (water bars and dips), and the road would be considered stored. A review will be conducted at the time of closure for any additional resource concerns needing addressed.

NFS roads are needed for long term management of the National Forest to access future timber lands or have resource concerns that require engineering controls in construction. Closed NFS roads needed in the future could be re-opened for timber salvage and/or expansion into development LUDs.

Temporary roads are not needed for long term management of the National Forest. Temporary roads do not access future timber lands and do not have resource concerns that require engineering controls in construction. All temporary roads would be decommissioned after timber harvest. This involves removing culverts and bridges, restoring natural drainage patterns, and allowing the roadway to re-vegetate.

Table 3-14. Proposed New Road Miles in the Central Kupreanof Timber Harvest Project Area

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Proposed New NFS Roads	0	7.3	25.1	0.0
Proposed Temporary Road	0	3.9	6.1	2.2

Roads Proposed for Reconstruction

Roads proposed for reconstruction are existing NFS roads currently in storage; most drainage structures have been removed to restore natural drainage patterns and the roadway has re-vegetated with alders 4-inch to 8-inch in diameter. Reconstruction activities would include brushing, clearing of alders and replacing drainage structures. Reconstruction would keep the roads in a safe and useful condition for which they are managed, while meeting Forest Plan Standards and Guidelines and following the applicable BMPs (See RMO road cards in Appendix B for site-specific items).

Road Costs

When developing a transportation system to support timber harvest, the Forest Plan directs to perform an integrated logging system and transportation analysis to determine the least-cost facility (considering cost of construction, maintenance, and hauling) and design standards necessary to meet LUD objectives. This is accomplished on an alternative by alternative basis through the NEPA Economic Analysis Tool – Residual Value (NEAT_R) version 2.15. This analysis is discussed further in the Timber Supply and Sale Economics section in this chapter.

Table 3-15 summarizes the proposed road construction and reconstruction by alternative. Road Management Objectives (RMOs) are included as part of Appendix B. The RMOs specify the design criteria, best management practices, resource concerns, and mitigation for each NFS road.

Estimated average cost of new NFS road is $200,000 per mile, average road reconstruction cost of $50,000 per mile, and average cost of new temporary road of $130,000 per mile. NFS roads in Southeast Alaska are more expensive to build than in other parts of the nation. The major factor that contributes to higher costs is obtaining the rock for the roadbed. Rock is obtained by blasting bedrock, which is then

hauled and shaped into a road over typically soft uneven terrain. Other factors that contribute to the high cost of constructing roads include the higher costs of shipping and labor, the numerous drainage structures needed, and complex logistics.

Wetlands Avoidance

An analysis was completed for the location of all new roads to minimize impacts to soils, water and associated resources in accordance with BMPs. Road location will be completed to avoid wetlands whenever practicable. Wetlands were unavoidable on some portions of the location due to safety, engineering design constraints and consideration for other resources. Alternatives to the location on wetlands would mean longer, higher-cost roads that may have impacted similar areas of wetlands. High value wetlands were particularly avoided wherever practicable.

Projects Common to all Action Alternatives

There are approximately 114 miles of NFS roads in the Kake road system, which encompasses the Central Kupreanof Timber Harvest project area. Of those 114 miles of roads there are approximately 94 miles of open roads (64 miles within the project area) that need maintenance to remain open. This maintenance generally includes brush cutting, blading of the road surface, ditching and cleaning of culverts to keep proper drainage. Of the 94 miles of open road, there are approximately 38 miles of mainline roads (6040, 6328, 6314, 6314S) that take first priority for maintenance.

Petersburg Ranger District historically has approximately $70,000 per year to spend on road maintenance in Kake. On the average it costs about $2,000 per mile to maintain roads which equates to approximately 35 miles of road per year that can be done in Kake. Generally, two thirds of the mainline roads are done and the remaining portion is spent on some selected side roads.

The only direct, indirect, or cumulative effects from transportation projects would be improved access due to keeping roads open. The removal of red fish crossings are dependent on the analysis and decisions made in the District's ATM EA document. The remaining Projects Common to all Action Alternatives would have no effects on the transportation system.

A Microsale program located along existing roads open for long-term use would have no effects on the transportation system as no new roads (NFS or temporary) would be built or closed in association with Microsale activities.

Direct and Indirect Effects

Alternative 1

Alternative 1 does not propose any new road construction. This is the no action alternative.

Under this alternative, current management plans would continue to guide the management of NFS roads. All system roads would be managed as directed by the Forest Plan, road management objectives, and previous NEPA decisions. This alternative would not increase, nor decrease, access to this area for recreation or subsistence activities. The 64 miles of currently open NFS road within the project area would remain open and maintenance would continue to be ongoing.

Alternative 2

Alternative 2 proposes construction of approximately 7.3 miles of NFS road. About 1.0 mile of construction would enter the South Kupreanof Inventoried Roadless Area. Future harvest along these roads is a possibility, as well as future extensions. This alternative would enhance opportunities for other timber harvest projects by providing access through suitable timber lands.

Alternative 2 proposes about 2.9 miles of reconstruction of existing NFS road to access timber harvest. This would include activities such as culvert replacement, surface rock replacement, and sub grade repair.

The following NFS roads would be used in this alternative; 45803, 45805, 45807, 45808, 45810, 45885, 45886, 45887, 45888, 45889, 45890, 45891, 45893, 45894, 45898, 45899, 6000, 6040, 6314, 6314S, 6315, 6326, 6327, 6328, 6330, 6333, 6334, 6336 and 6339.. For more specific information regarding these roads see Appendix B Road Cards.

This alternative proposes approximately 3.9 miles of temporary road. All of the temporary roads would be decommissioned after timber harvest. See unit cards for temporary road site-specific detail.

This alternative would use Little Hamilton LTF (Log Transfer Facility) and incur approximately $2,039,000 in road costs.

There would be new stream crossings that may require site-specific design consideration for volume of flow, fish habitat, or other design complexity. See road cards for site-specific detail.

An additional 1.69 miles of existing open NFS Roads (6327, 45805, 45807) used in the proposed timber harvest, would be closed and placed into storage up to ten years after the timber sale. Any red fish crossings would be pulled at the time of storage.

Motorized access would temporarily increase during the timber sale and for up to ten years after the completion of timber sale activities. Approximately 74.2 miles of road will remain open for up to ten years

after the timber sale. Motorized access would then decrease in the long term as roads are closed and put in intermittent service. Approximately 62.3 miles of NFS road would ultimately remain open with this alternative. Closed roads would still provide a long term increase in non-motorized access.

Roads in storage would remain in a self-maintaining state, making more road maintenance funds available. Having more maintenance funds available and less miles open to maintain would help maintain the open roads to their operating standards and reduce deferred maintenance cost.

Alternative 3

Alternative 3 proposes construction of approximately 25.1 miles of NFS road. About 13 miles of new NFS road would enter the South Kupreanof Inventoried Roadless Area. Future harvest along these roads is a possibility as well as future extensions. This alternative would enhance opportunities for other timber harvest projects by providing access through suitable timber lands.

This alternative proposes about 9.1 miles of reconstruction of existing NFS roads to access timber harvest. This would include activities such as culvert replacement, surface rock replacement, and sub grade repair.

The following NFS roads would be used in this alternative; 45800, 45803, 45805, 45806, 45807, 45808, 45810, 45885, 45886, 45887, 45888, 45889, 45890, 45891, 45892, 45893, 45894, 45895, 45896, 45897, 45898, 45899, 45915, 6000, 6040, 6314, 6314S, 6315, 6326, 6327, 6328, 6330, 6333, 6334, 6336 and 6339 would be involved in this alternative.

This alternative proposes 6.1 miles of temporary road of which about 2.0 miles would enter the South Kupreanof Inventoried Roadless Area. All temporary roads would be decommissioned after timber harvest.

This alternative has all the timber transported to Little Hamilton LTF and would incur approximately $6,017,000 in road costs.

There would be new stream crossings that may require site-specific design consideration for volume of flow, fish habitat, or other design complexity. See road cards for site-specific detail.

An additional 1.69 miles of NFS roads used in the proposed timber harvest (6327, 45805, 45807)) would be closed and placed into storage up to ten years after the timber sale. Any red fish crossings would be pulled at the time of storage.

This alternative would have the greatest temporary increase for motorized public access to the area. The Project Area would provide about 98.2 miles of roads open for motorized vehicle use for up to ten years after the timber sale. Motorized access would then decrease as

roads are closed and put into intermittent service. Ultimately, approximately 62.3 miles of NFS road would remain open with implementation of this alternative. Closed roads would still provide a long-term increase in non-motorized access.

Roads in storage would remain in a self-maintaining state making more road maintenance funds available. Having more maintenance funds available and less miles open to maintain would help maintain the open roads to their operating standards and reduce deferred maintenance cost.

Alternative 4

Alternative 4 proposes no new NFS roads and no new road construction in any inventoried roadless areas. Approximately 2.6 miles of reconstruction of existing NFS road would be needed to access timber harvest. This would include activities such as culvert replacement, surface rock replacement, and sub grade repair.

The following NFS roads would be used in this alternative; 45803, 45805, 45807, 45808, 45810, 6000, 6040, 6314, 6314S, 6315, 6326, 6327, 6328, 6330, 6333, 6334, 6336 and 6339 would be involved in this alternative.

This alternative proposes 2.2 miles of temporary road. All temporary roads would be decommissioned after timber harvest. See unit cards for temporary road site specific detail.

This alternative has all timber transported to Little Hamilton LTF and will incur approximately $416,000 in road costs.

An additional 1.69 miles of NFS roads used in the proposed timber harvest (6327, 45805, and 45807) are listed in the RMOs to be closed and placed in storage up to ten years after the timber sale. Any red fish crossings would be pulled at the time of storage.

This alternative changes access the least of all action alternatives. While Alternative 4 does not create any new access with the construction of any NFS roads, motorized access would be slightly increased with the 2.6 miles of existing NFS road reconstruction. Approximately 66.6 miles of road would remain open for up to ten years after the timber sale. Motorized access would then decrease in the long-term as roads are closed and put in intermittent service. About 62.3 miles of NFS road would remain open with implementation of this alternative.

Roads in storage would remain in a self-maintaining state making more road maintenance funds available. Having more maintenance funds available and less miles open to maintain would help maintain the open roads to their operating standards and reduce deferred maintenance cost.

Comparison of Alternatives Tables

All roads, both existing and proposed, would be located, designed, constructed or reconstructed, and maintained following Best Management Practices (BMPs), and other applicable laws, regulations, and specifications. Refer to the road cards in Appendix B for more information on specific BMPs.

Table 3-15. Existing and Proposed Open Road Miles within the Central Kupreanof Timber Harvest Project Area

	Alt 1	Alt 2	Alt 3	Alt 4
Miles of Open Existing NFS Road	64	64	64	64
Miles of Proposed New NFS Road Construction	0	7.3	25.1	0
Miles of Proposed Temporary Road Construction	0	3.9	6.1	2.2
Miles of Reconstruction of Existing NFS Road	0	2.9	9.1	2.6
Total Miles of NFS Road Left Open for up to 10 Years after Harvest	64	74.2	98.2	66.6
Miles of Proposed Existing NFS Road to Close within 10 Years of Harvest	0	1.69	1.69	1.69
Total Miles of NFS Road Remaining Open with Implementation of Alternative	**64**	**62.3**	**62.3**	**62.3**

Table 3-16. Planned Road Construction Miles and Cost by Alternative

Alternative	New Temporary Road Miles	New NFS Road Miles	Reconstruction NFS Road Miles	Total Road Costs*
1	0	0	0	$0
2	3.9	7.3	2.9	$2,039,000
3	6.1	25.1	9.1	$6,017,000
4	2.2	0	2.6	$416,000

Cumulative Effects

The cumulative effects boundary includes the Kake Road System. The Catalog of Events for Kupreanof Island was referenced for this analysis.

While the number of open miles and therefore access may temporarily increase for up to ten years after timber sale activities with any action alternative, the overall open road miles associated with this project access would decrease slightly in the long term. Up to approximately 1.69 miles would be closed within the project (see Table 3-15). Closure of roads includes mainly side roads and no main access routes are proposed for closure.

The Petersburg Ranger District is presently working on the Access and Travel Management Plan and analysis for the District that will affect access on the Kake Road System by potentially closing some roads, restricting class of vehicle use, or decommissioning roads. However, the RAP for this project only proposes an additional closure of about seven miles (mostly side roads and roads with resource issues) and decommissioning of another about 2.8 miles (which lead into an OGR). Road management objectives and use designations for the entire Kake Road System roads that are not associated with proposed timber harvest activities will be analyzed and decisions made in the PRD ATM EA. Decisions from the Central Kupreanof project will be incorporated by the PRD ATM EA and analyzed cumulatively. The District's ATM EA was published in July of 2009. The Motorized Vehicle Use Map will be updated yearly. Maps will be available at the Petersburg Ranger District.

Other potential activities could affect access and open road miles on the Kake Road System. Potential activities could include Forest

Service activities that implement the Forest Plan as well as State or Federal Highway projects and the Kake-Petersburg Intertie.

Such projects, in addition to the proposed activities with the Central Kupreanof project, could increase access either for the short-term or long-term, as well as decrease long-term access overall on the Kake Road System.

Irreversible and Irretrievable Commitments of Resources

Borrow pits and quarries would be needed for road construction and reconstruction under all action alternatives. The amounts of shot rock and crushed rock would vary with each alternative and miles of proposed construction and reconstruction. Location and sites can be designed, as well as timing used, to minimize the impacts upon other resource values and existing facilities. The extraction of shot rock or gravel would be apparent and excavation sites would be evident, altering the landscape, even with screening. These resources are not replaceable therefore these actions would be irreversible. See Figure B-1 for location of existing rock sources proposed to reuse and expand.

Rock quarries are usually developed on a hillside by removing any trees and overburden from above the bedrock, which is usually within five feet of the surface. The bedrock is then drilled and blasted to produce rock in one foot diameter and less size. This rock is then used as an overlay to produce the road surface which supports the vehicles.

Compliance with the Forest Plan and Other Regulatory Direction

All alternatives comply with Forest Plan standards and guidelines. The standards and guidelines relevant to transportation can be found in the Tongass Forest Plan beginning on page 4-80. All roads are constructed to American Association of State Highway Transportation Officials (AASHTO) and Occupational Safety and Health Administration (OSHA) standards. Roads are constructed to meet Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-03.

Clean Water Act

A discharge of dredge or fill material for normal silvicultural activities such as harvesting for the production of forest products is exempt from Section 404 permitting requirements in waters of the United States, including wetlands (404(f)(1)(A). Forest roads qualify for this exemption only if they are constructed and maintained in accordance with best management practices (BMPs) to assure that flow and

circulation patterns and chemical and biological characteristics of the waters are not impaired (404)(f)(1)(E). The BMPs that must be followed are specified in 33 CFR 323.4(a). All road construction would follow the applicable BMPs.

Minerals and Geology Resource

There are no mining claims in the project area that the road system accesses or runs across.

Invasive Species Prevention

Contracts, permits, road maintenance plans and project design documents would contain appropriate provisions concerning the prevention and/or spread of invasive species along the road system.

Mitigation and Monitoring

Best Management Practices (BMPs) are used to assure soil and water resources are considered in transportation planning activities. Specific BMPs are listed by resource on the road cards.

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

- Cutslope erosion would be mitigated by timely erosion control.
- Side slopes of greater than 67% would be mitigated by full bench construction and slope stabilization, if necessary.
- Road construction across muskegs would be mitigated by using wetland protection measures.
- Open road density, road induced sedimentation, road maintenance requirements would all be mitigated through timely road storage after harvest activities are complete.

Additional details of specific road construction concerns and mitigation measures are shown on the road cards. Site-specific mitigation measures are listed on the road cards by resource.

Other Resources Considered

Botany

This section provides a summary of the botanical work done to analyze the potential effects of this project on sensitive, rare, and invasive plant species. Detailed information on the survey methods and effects analysis for sensitive, rare and invasive plants are found in the Botany resource report, Biological Evaluation for Plants and Risk Assessment for Invasive Plants (Clemens 2008).

Individual analysis was completed for each plant category (sensitive, rare, and invasive). The 'Effects Common to All Action alternatives' apply to, and have been considered in, all three following plant analyses.

Effects Common to All Action Alternatives

Projects Common to All Action Alternatives

Trail Maintenance and Cabin Maintenance

There would be no effects to threatened, endangered, sensitive, or rare plants from the proposed stewardship project of maintaining the four area trails and Big John Bay cabin.

The risk of spreading invasives plants with these activities is low since there would be no new ground disturbance and most of the invasives found on the trails were limited to the roadside trailheads. No high priority species were found near the trailheads or cabin. Gravel sources will be checked before using on the trails to insure no high priority invasive weed species were present at the site.

Invasive Plant Control

There would be no effects to threatened, endangered, sensitive or rare plants from the proposed invasive plant control stewardship project. This project would help control and limit the spread of invasive plants present in the project area, particularly the spotted knapweed.

Fisheries/Hydrology

There would be no effects to threatened or endangered plants from the proposed fisheries/hydrology stewardship project of pulling culverts on fish streams on closed roads. While no known populations of sensitive or rare plants would be affected, correcting or pulling

culverts has the potential to affect unknown populations and habitat at stream crossings.

There is moderate risk of spreading invasive plants into uninfected areas if the equipment used to pull the culverts goes from a weeded area to a weed-free area.

Silviculture/Wildlife

There would be no effects to threatened, endangered, sensitive or rare plants from the proposed silviculture stewardship project of pre-commercial thinning second-growth stands.

There would be no effects to invasive plants with this project. Second-growth stands are not likely habitat for invasive plants due to the thick tree growth. While the pre-commercial thinning would allow more light into the stands, the ground would not be disturbed. Leaving the cut trees on the ground would further inhibit invasive weed growth.

Transportation

The proposed transportation stewardship project of maintaining the Kake area roads would not adversely affect any known threatened, endangered, sensitive or rare plants in the project area. One sensitive plant species, Davy mannagrass *(Glyceria leptostachya),* is sometimes found in roadside ditches and could be affected by ditch maintenance. However, this species thrives in disturbed areas, so increased disturbance could actually enhance its habitat and populations. Also, this species is more abundant on the Tongass than once thought, and has been removed from the 2009 Alaska Region Sensitive Plant List.

There is moderate risk of spreading invasive plants into uninfected areas with road maintenance if the equipment used goes from a weeded area to a weed-free area.

Microsales

The proposed Microsale areas along NFS roads open for long term management 6030, 6040 and 6314, 6314S, 6326, 6328, 6334, 6336, 6339 and 6367 may impact unknown individual rare or sensitive plants but would not likely lead to federal listing for any species.

The proposed Microsale areas would have no significant effects to invasive plants.

Threatened and Endangered Plants

No threatened or endangered plants are known or suspected to occur in Southeast Alaska; therefore federally listed plants were not evaluated.

Affected Environment for Sensitive Plants

The analysis area considered for direct and indirect effects, for sensitive and rare plants, is the Central Kupreanof project area. For cumulative effects, the area considered is the Tongass National Forest.

Botanical surveys were conducted in the major plant communities present in the project area. One hundred fifty-five vascular plant species were identified from these surveys. Detailed information about common forest and wetland types in the project area can be found in the Silviculture-Vegetation resource report and the Soils-Wetlands resource report.

Botanical surveys were concentrated in proposed harvest units, where populations could be directly affected. Only limited surveys were completed in non-harvest areas. Therefore, it is possible sensitive plant populations occur in areas of proposed road construction as well as within the project area where no harvest or road building activities are proposed.

Units of measure

- Number of known plant populations affected by proposed activities
- Qualitative discussion of potential effects to unknown populations and habitat
- Determinations from the Biological Evaluation (Clemens, 2008a) risk assessment

Sensitive Plants

The Regional Forester's sensitive species list was undergoing revision during the analysis for the Central Kupreanof project. The Regional Forester signed the revised list on February 2, 2009. The revised list does not include several plants analyzed in the Biological Evaluation for this project. The following plants were analyzed but are no longer designated as sensitive: *Glyceria leptostachya, Hymenophyllum wrightii, and Poa laxiflora*. The two sensitive species found in the Central Kupreanof project area, Wright filmy fern *(Hymenophyllum wrightii),* and Davy mannagrass (*Glyceria leptostachya*), have been removed from the 2009 Alaska Region Sensitive Species List. Furthermore, 11 rare plants are newly designated as sensitive in the 2009 list revision. None of the newly added species were found in the Project Area. Only one species on the revised list has been documented on the Petersburg Ranger District. The lichen *Lobaria amplissima* has been found on trees on windswept, exposed beaches on south Mitkof Island and Tebenkof Bay on Kuiu Island.

Due to the project's advanced stage when the 2009 list was approved and signed, the Central Kupreanof project surveys and following analysis were based on the 2002 list. The difference would be fewer effects to sensitive species in the area with the revision since none of the new species were found in the project area. The 2009 list and the analysis of the rare and sensitive plants found within the Central Kupreanof project area can be found in the Botany resource report and Biological Evaluation located in the planning record.

Sensitive Plants Known or Suspected in the Project Area

Four sensitive species from the 2002 Alaska Region Sensitive Plant List are suspected or known to occur in the project area since the area contains appropriate habitat and is within the known or suspected range of the plants. Three of the four species were removed from the sensitive plant list because they are more widespread than previously thought. Though these species are not all on the 2009 Sensitive List, they were analyzed in the Biological Evaluation for Sensitive Plants (See Appendix E of this document) due to their status as sensitive during this project analysis. Two of those species are known to occur on Kupreanof Island and two are suspected to occur there.

Glyceria leptostachya – This species is found in wet habitats often where there is natural or human-caused disturbance, including along streams, ponds, lake margins and roadside ditches. Roots are often submerged.

Hymenophyllum wrightii –This species is found at the base of trees, on downed logs, and rock outcrops in damp, humid woods. The gametophyte form of this species has been found to be fairly common in low elevation coastal areas in the southern and central Tongass.

Poa laxiflora- This species has been found throughout the Tongass, typically on upper beach meadows, estuaries, and streamsides.

Romanzoffia unalaschcensis- This species is known from a few widespread areas in Southeast Alaska. It is often associated with streamside/riverbank habitats and rock outcrops, often near the ocean.

Environmental Consequences

Direct and Indirect Effects

Two sensitive plant species from the 2002 list were found in the Central Kupreanof project area: Wright filmy fern *(Hymenophyllum wrightii)* and Davy mannagrass *(Glyceria leptostachya)*. Seventeen populations of *Hymenophyllum wrightii* were found during surveys in the area with fourteen populations found in nine proposed units, and three in locations outside proposed units.

One population of Davy mannagrass *(Glyceria leptostachya)* was found on the north shore of Kluane Lake east of Unit 254. The population would not be directly, or indirectly, affected by timber

harvest activities since it is outside any proposed units. Disturbance to its habitat could have beneficial effects to populations.

Alternative 1

There would be no direct or indirect effects to sensitive plants with implementation of Alternative 1.

Alternatives 2, 3 and 4

In Alternatives 2 and 3, fourteen known populations of Wright filmy fern *(Hymenophyllum wrightii)* would be affected by proposed timber harvest activities. Thirteen known populations would be affected in Alternative 4. Unknown populations may also be affected. Plants may be destroyed and habitat lost in road corridors due to trampling by workers, machinery, and deposition of road materials. Plants may be destroyed in timber harvest units due to trampling by workers, trees falling on the plants, trees dragged over the plants during removal or slash deposited on the plants. Plants may also be destroyed from operation of shovel yarding equipment and habitat alteration from soil compaction.

Indirect effects on these species in other locations as a result of timber harvest and road construction are essentially undocumented at this time. However, changes in the habitat condition may have some indirect effects such as soils moisture changes, light regime changes and increased susceptibility to disturbances (human and natural). Some of the possible changes include increased groundwater hydrology due to decreased levels of evapotranspiration after harvest; alterations due to possible sedimentation caused by landslides or windthrow as a result of timber harvest or roading activities; increased competition from native or non-native species that may establish as a result of road building activities and other disturbance; impacts caused by changes in the light regime as a result of canopy removal; and increased disturbance caused by humans who may access these areas for recreation or subsistence use.

In Alternatives 2 and 3, three populations located within riparian buffers or dropped units would remain unaffected. In Alternative 4, one additional population would be protected by the changed shape of Unit 310.

Cumulative Effects

Since there would be no direct or indirect effects in Alternative 1, there would be no cumulative effects in associated with this project in Alternative 1. For Alternatives 2, 3, and 4, the Catalog of Events was referenced. The following activities may add to the cumulative effects to sensitive species or their habitat within the project area; road and trail construction, road storage or decommissioning, gravel extraction, timber harvest, subsistence use and recreation. While individual populations and areas of potential habitat may be impacted by the proposed activities within the project area and across the Forest, cumulatively, the effects are not likely to lead to federal listing of any species.

As more sensitive plant surveys are conducted and more potential habitats surveyed, specialists are learning better methods on how to look for these plants. With this increasing knowledge, more plants are being found. Across the Tongass National Forest, from just the surveys concentrated in areas of proposed activities, approximately 86 populations of *Hymenophyllum wrightii* have been found, seventeen populations in the Central Kupreanof project area alone. The 2009 Regional sensitive plant species list did not include this species reflect due to the recent findings of abundant populations across the Forest.

Table 3-17. Determinations for Sensitive Plant Species by Alternative.

Species	Known or Suspected in Project Area	Alternative 1	Alternatives 2-4
Hymenophyllum wrightii	Known	No Impacts	*May impact Individuals
Glyceria leptostachya	Known	No Impacts	*May impact Individuals
Poa laxiflora	Suspected	No Impacts	*May impact individuals
Romanzoffia unalaschensis	Suspected	No Impacts	No impacts

*May adversely impact individuals, but not likely to result in a loss of viability in the Project Area, nor cause a trend toward Federal listing.

Affected Environment for Rare Plants

Two rare plant species were found in the project area and analyzed in the Botany Resource Report for the Central Kupreanof Timber Harvest EIS (Clemens 2008). Rare plant species considered for this project include any plant listed on the Alaska Natural Heritage Program (AKNHP) Vascular Plant Tracking List that was found during botanical surveys in the project area. One population of *Galium kamtschaticum* and eight populations of *Listera convallarioides* were found in the project area.

Botanical surveys were concentrated in proposed harvest units, where populations could be directly affected. Only limited surveys were completed in non-harvest areas and proposed road corridors. Therefore, it is possible that rare plant populations occur in areas of proposed road construction as well as in areas where no harvest or road building activities are proposed.

Units of measure

- Number of known plant populations affected by proposed activities
- Qualitative discussion of potential effects to unknown populations and habitat
- Determinations from the risk assessment completed for the Botany Resource report (Clemens, 2008c)

Rare Plant Habitat

Galium kamtschaticum and *Listera convallarioides* are often found in the same habitats: wet lady fern/skunk cabbage/forb communities. This community type is common from low to subalpine elevations in the Central Kupreanof project area and much of the Tongass National Forest. *Galium kamtschaticum* is also found in better-drained settings, such as avalanche slopes, brush fields or broken mountain slopes near the subalpine zone. *Listera convallarioides* is a perennial orchid typically found in wetter sites, including forested edges, openings with lady fern and skunk cabbage, lady fern and forb communities, and fens.

Environmental Consequences for Rare Plants

The assessment of risks to populations of rare plants takes into account size, density, vigor, habitat requirements, location of the population, and consequence of adverse effect on the species as a whole within its range and within the Tongass National Forest.

Direct and Indirect Effects

Alternative 1 (No Action)

Alternative 1 is the "no action" alternative and would have no direct or indirect impact on rare plant populations or their habitat.

Alternatives 2, 3, and 4

The direct effects to rare plants are the same in all the action alternatives (Alternatives 2, 3, and 4) since they occur in or near units that are proposed for identical actions in the three alternatives. Also, where rare plants were found in or near deferred units or roads, those activities were deferred in all three alternatives. The direct and indirect effects described under "Sensitive Plants" are the same for rare plants and their habitat.

Galium kamtschaticum (Boreal bedstraw):

The known population of *Galium Kamtschaticum* in Unit 229 would be impacted by harvest activities. The consequences of adverse impacts to this rare plant due to project activities are moderate. The likelihood of adverse effects is high since it is in a unit proposed for harvest in all action alternatives. The overall risk to this species is low because it commonly occurs in open-forested and non-forested niches, often where management activities are not likely to occur.

Listera convallarioides (Broad-leaved twayblade):

The consequences of adverse impacts to this rare plant due to project activities are low to moderate as two of the eight populations identified in the Central Kupreanof project area would be directly impacted by harvest. Habitat would also be impacted. The likelihood of adverse effects is moderate as harvest may change the hydrology and microclimate needed by this plant. The overall risk to this plant in the Central Kupreanof project area is low because it is commonly found in habitats that will be avoided by harvest activities and foreseeable future activities.

The timber harvest activities could also affect some undetected rare plants. More *Listera convallarioides* and *Galium kamtschaticum* populations could possibly occur in areas where no harvest or road construction is proposed since most surveys were concentrated in proposed units and only limited surveys were done in non-harvest areas.

Cumulative Effects

Since there would be no direct or indirect effects in Alternative 1, there would be no cumulative effects associated with this project in Alternative 1. For Alternatives 2, 3, and 4, the Catalog of Events was referenced. The following activities may add to the cumulative effects to sensitive species or their habitat within the project area; road and trail construction, road storage or decommissioning, gravel extraction, timber harvest, subsistence uses, and recreation. Individual populations and areas of potential habitat may be impacted by various proposed activities (such as, but not limited to, those listed above) across the Forest.

As more rare plant surveys are conducted and more potential habitats surveyed, specialists are learning better methods on how to look for these plants. With this increasing knowledge, more plants are being found. Recent findings across the Tongass National Forest of *Listera convallarioides* and *Galium kamtschaticum* populations indicate population trends may be higher than anticipated and may affect overall State rankings in the future. To date, with inclusion of populations found in the Central Kupreanof project area, 40 populations of *Galium kamtschaticum* and 68 populations of *Listera convallarioides* are known on the Tongass National Forest. These populations have been found from surveys specifically concentrated on proposed disturbance areas, such as in proposed timber harvest units or road prisms. While some of these populations and potential habitats may be affected by Forest projects, by the number of occurrences discovered and the similar habitats in non-development areas, it can be suggested that large unknown populations may occur outside proposed activity areas and remain unaffected. In fact, much of the primary habitat for the known or suspected rare plants is not in productive timber stands and is commonly found throughout the Tongass.

Invasive Plants

The area of analysis for invasive plants includes the project area plus the roads outside the project area that connect to Kake. This is because roads are the main vector for spreading invasive plants.

An "invasive plant species" is a plant, including its seeds, spores or other biological material that is not native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental arm or harm to human health (Executive Order 13112; USDA Forest Service 004a; USDA Forest Service 2005). Invasive plant surveys were conducted in the project area in 2006, primarily on the roads and rock quarries.

An invasive plant risk assessment for the Central Kupreanof project was completed and included in the project record with the Botany resource report. This risk assessment clarifies the management concerns, objectives and mitigation measures proposed to address invasive species for the Central Kupreanof project.

Units of Measure

- Qualitative discussion of potential effects and risk of spread determinations from Invasive Plant Species Risk Assessment (Clemens, 2008b)

Priority Invasive Plant Species

Eight invasive plant species found on the Kake road system are ranked moderately to highly invasive, according to the Alaska Natural Heritage Invasive Plant Ranking System (2007, Alaska Natural Heritage Foundation Weed Ranking Project).

Three of the high priority invasive species (FSM 2080 R10 TNF Supplement 2000-2007-1) on the Kake road system occur in the project area. The other five species occur on non-national forest lands within four miles of the City of Kake. Spotted knapweed, one of the three high priority species found within the project area, is recommended for control. It is a small isolated population found on Road 6337. The other two species in the project area, oxeye daisy and reed canarygrass, are not recommended for control because they are widespread along most roads in the area and successful control without the use of pesticides is not likely. Future control of these species may be evaluated in District-wide programmatic decisions. Table 3-18 lists the known invasive plant species along the Kake road system.

Table 3-18. High priority Invasive Plants on the Kake Road System

Species	Common Name	Status
Actively controlling these plants where feasible on the Tongass		
Centaurea biebersteinii	spotted knapweed	Rd 6337, within project area.
Senecio jacobaea.	tansy ragwort	On the beach next to the ferry terminal in Kake
Sonchus arvensis. ssp. uliginosis	perennial sowthistle	In City of Kake, several locations
Polygonum cuspidatum Sieb & Zucc.	Japanese knotweed	In City of Kake and one rockpit near town
Actively controlling these plants only in certain locations on the Tongass		
Leucanthemum vulgare	oxeye daisy, white daisy	Occurs commonly along Kake roads
Melilotus alba Medikus	white sweetclover	In rockpit 7 miles from project
Phalaris arundinacea	reed canarygrass	Occurs commonly along Kake roads including within the project area
Brassica rapa	field mustard	In the City of Kake

1 Plants in bold are located on National Forest lands.

Direct and Indirect Effects

Habitat vulnerability is a review of site specific factors that are present in the project area which would make the project area vulnerable or resistant to invasive plant infestation. For most invasive plants, two elements usually exist which promote their spread: open sunlight and exposed mineral soil (disturbance). Mineral soils are generally found along riparian areas, estuaries, and mountain and hill slopes of forested habitats. Therefore, the habitats with the highest vulnerability related to soil type is riparian areas, estuaries and other stream corridors directly adjacent to road corridors.

The degree of soil disturbance within forested habitats as a result of timber harvest is related to the type of logging system used to remove the timber. For example, cable systems using suspension (partial or full) will create little or no soil disturbance; however, ground-based systems (high lead and shovel) have the potential to create more soil disturbance.

The primary vectors responsible for invasive plant species spread within the project area are wind and water, although wildlife and the use of vehicles may also play a role to a lesser degree.

Plants listed in Table 3-18 are considered a high risk to the project area either because they are highly invasive species already present in the project area or they are moderate to highly invasive species known on the Kake road system. While the project invasive plant species risk assessment analyzes overall risk of spread, the likelihood of some of the individually listed species to spread into the project area is quite low. For example, the Japanese knotweed generally spreads through movement of contaminated soil. Because the population is outside of the Project Area and will not be disturbed by project activities, there is very little risk this invasive will spread to the Project Area. Also, the white sweetclover population is isolated in a rockpit seven miles from the project area. Because this rock source will not be used for proposed activities, the risk of spread is very low. Due to the distance from the Project Area and haul route, there is a moderately low to low risk of spread for both the perennial sowthistle and field mustard populations.

The tansy ragwort is also located outside the project area. It is located on the beach next to the ferry terminal in Kake. The primary vectors spreading the tansy ragwort are wind and vehicles. Because it is unlikely that vehicles will come in contact with the plants the risk of spreading due to vehicle traffic is low.

The small isolated population of spotted knapweed was found along Road 6337. This road, while in the project area, would not be used in any proposed alternative. Therefore, because the population is not located along the haul route or in an area proposed for harvest, and is recommended for control through the Projects Common to all Action Alternatives, the risk of spread is low.

While the project area is not an area where the oxeye daisy and reed canarygrass are being actively controlled, the risk of spread of these invasive plants along the road corridor is moderate. However, with implementation of soil erosion best management practices (BMPs) the primary habitat vulnerability elements can be limited and the risk lessened. For example, immediately reseeding disturbed areas in new road construction and reconstruction corridors with standard seed mix

can lessen the time mineral soils are exposed and open to sunlight, encouraging the establishment of native species.

Alternative 1 (No Action)

There is no increased risk of spreading invasive plants into the project area with this alternative.

Alternative 2

Overall this alternative has a low to moderate risk of increasing the spread of invasive plants in the project area because there would be some ground disturbance with the 11.2 (NFS and temporary) miles of new road construction proposed and 2.9 miles of reconstruction.

Alternative 3

Of all action alternatives, Alternative 3 has the highest risk of increasing the spread of invasive plants in the project area because it proposes the most new road construction (NFS and temporary) of 31.2 miles and 9.1 miles of reconstruction.

Alternative 4

With the exception of the no action alternative, this alternative has the lowest risk of increasing the spread of invasive plants in the project area because it only proposes 2.2 miles of temporary road construction and 2.6 miles of reconstruction.

Alternatives 2, 3, and 4

The activities occurring in Alternatives 2, 3, and 4 have an overall assessment of moderate to low risk for increasing the spread of existing invasive plants (Invasive Plant Risk Assessment, Clemens, 2008) as well as increasing new introductions of other invasive plants due to ground disturbance as a result of new and reconstructed road development.

Cumulative Effects

The Catalog of Events was referenced in identifying cumulative effects for along the Kake Road System. Programmatic hand or mechanical treatment of weeds and cooperative work with the City of Kake, would help to limit the spread of invasive weeds related to past, ongoing, and future projects. Road maintenance would continue along the road system and depending on measures taken, may continue to pose a moderate risk of invasive species spread along the road corridor, specifically of the oxeye daisy and reed canarygrass. The District Access Travel Management NEPA document will decide whether roads remain open (and type of vehicle use), be placed into storage, or be decommissioned. The effects of these decisions and risk to spread of invasive species will be analyzed in that document; however, whenever there are ground-disturbing activities, particularly within the road corridor, and the presence of invasive plant species, there will be some foreseeable risk of spread.

Alternative 1

Alternative 1 would have no cumulative effect on weed species as it would not cause any new disturbance or additional road construction in the project area for weed species to occupy or spread.

Alternatives 2, 3, and 4

Disturbances caused by road building and timber harvest favor the spread of invasive plants. It is likely that some invasive plants would be spread or spread naturally into newly disturbed areas. Currently most weed species are limited to the road corridor and rock quarries. The spotted knapweed population on Road 6337 is recommended for control with Projects Common to all Action Alternatives.

Management Considerations/Mitigation and Monitoring

The invasive plant management goals and strategies for this project will follow the guidance contained in the new Forest Service Manual supplement (FSM 2080 R10 TNF Supplement 2000-2007-1) and the Region 10 and Tongass Invasive Plant Management Plans. The primary goal for this project is prevention and minimization of spreading certain invasive plants further into the project area. It will focus on limiting the introduction and spread of existing high priority invasive plants into new areas, especially in the process of road construction.

Several factors for management are considered:

1. Focus efforts on high priority invasive plants that the Tongass N.F. has committed to actively control where feasible. In the Central Kupreanof area, this means efforts will focus on controlling the spotted knapweed population found on Road 6337. This could be accomplished by including the work in a stewardship contract or by using Forest Service personnel to hand pull the plants annually.

2. Management considerations for this project will not include those high priority invasive plants known in the project area which the Tongass N.F. has committed to actively control only in certain locations. These include the following species:

Leucanthemum vulgare – oxeye daisy

Phalaris arundinacea – reed canarygrass

The logic for not treating these species at this time is due to their widespread distribution along the Kake road system and the low likelihood of success in their ultimate control. However, the application of soil erosion BMPs will assist in reducing the risk of continued spread. Management efforts across the Forest will focus on avoiding the introduction of these species into pristine habitats and Land Use Designations that are managed for natural and near natural

conditions. These do not include the Timber LUD, of which this project area is located.

With the above stated management considerations, the following mitigation measures are recommended for management to consider in lowering the risk of spread of invasives:

- Require contractors to use approved rock sources, which have been identified by the Forest Service.
- This will require an invasive species specialist to inventory all rock sources prior to use and certify in writing that it is acceptable. The existing rock quarries in the project area were surveyed in 2006 and no high priority species were found.
- If any rock sources become contaminated with high priority species and certification can not be attained without treatment methods, consider the use of contaminated rock for re-constructing existing roads only.
- Rock material free from high priority species will be required of all new road constructions and new landings.
- Monitor the newly constructed roads, the active quarries, and the project area for at least 3 years after the project for new non-native plant introductions.
- Eradicate or control any newly introduced high priority invasive plant species/populations not currently in the project area after project completion as part of the District 5-year program of work for invasive species management. Prioritize controlling any new populations relative to other populations of high priority species needing treatment on the District.

Wildlife

Resource Analysis Area

The Central Kupreanof project area is located on the Petersburg Ranger District on the Tongass National Forest. The project area is located on Kupreanof Island and is along the Kake road system. The project area is approximately 152,517 acres. It follows the boundary lines of Value Comparison Units (VCUs) 429, 438, 426, 436, 427.1 (Figure 1-1) which account for most of the interior portion of Kupreanof Island.

Within the project area wildlife habitat can be assessed based on different types of geographical areas. Biogeographic Provinces (BP) or Game Management Units (GMU) are geographical areas defined by the Alaska Department of Fish and Game (ADFG) to manage wildlife populations. Wildlife Management Areas (WAAs) are subdivisions of GMUs and are used by ADFG for data collection purposes. VCUs are National Forest System land divisions that approximate watersheds. See Figure 1-1 for delineations of WAAs and Biogeographic Provinces.

Wildlife habitat, for this project, will be analyzed at the Biogeographic Province level. This is consistent with the analysis of POG used in the Forest Plan. The Biogeographic Province was used in the Forest Plan to describe the amount of Productive Old-Growth forest (POG) remaining on the Tongass and is summarized for the Kupreanof/Mitkof Biogeographic Province. Wildlife habitat is also analyzed at the project level, disclosing localized effects, and also using multiple WAAs. Because it is possible for animals to move between Kuiu Island and Kupreanof Island, seven WAAs representing hunting/trapping use areas, were used to show effects on wildlife habitat.

The amount of productive old-growth (POG) forest (a percentage of what was existing prior to large-scale and human-caused habitat change) on the Tongass is a good indicator of habitat loss, as well as how fragmented habitat is likely to become.

Species Screen

The National Environmental Policy Act (NEPA) directs the Forest Service to conduct a full and fair discussion of significant issues, and to identify and eliminate issues that are not significant. Some elements of wildlife habitat require a detailed analysis and discussion to determine potential effects. Other elements may not be affected, or may be affected at a level that does not influence use, occurrence, or

the decision to be made. Others can be adequately addressed through design of the project. These elements will not necessarily require further analysis.

The species screened for relevancy include threatened, endangered, sensitive, Management Indicator Species (MIS), and any others identified through the scoping process. The appropriate method and level of analysis needed to determine potential effects are influenced by a number of variables including; presence of species or habitat, the scope and nature of the activities associated with the alternatives, and the risks that are known or expected to occur within the project area. Species that may be potentially affected by the proposed actions will receive a detailed analysis. However further analysis was determined to be unnecessary for those species considered absent from the project area, where impacts could be avoided or where impacts would be inconsequential given the type or magnitude of the action (see Table 3-19).

Table 3-19. Species Screen Analysis

Species	Probability of Occurrence	Potential for Measurable Effects to Habitat in Analysis Area	Need for Further Analysis
Threatened and Endangered Species			
Humpback Whale (*Megaptera novaengliae*)	Mod	No	No
Stellar Sea Lion (*Eumetopias jubatus)*	Mod	No	No
Federal Candidate Species			
Kittlitz's Murrelet *(Brachyramphus marmoratus)*	Low	No	No
Yellow-billed Loon (*Gavia adamsii*)	Low	No	No

Sensitive			
Aleutian Tern (*Sterna aleutica)*	Low	No	No
Black oystercatcher *(Haematopus bachmani)*	Mod	No	No
Trumpeter Swan *(Cygnus buccinator)*	Mod	Yes	No
American Osprey *(Pandion haliaetus carolinensis)*	Mod	Yes	No
Queen Charlotte Goshawk *(Accipiter gentilis laigni)*	High	Yes	No
Peale's Peregrine Falcon *(Falco peregrinus pealei)*	Low	No	No
MIS			
Red Squirrel *(Tamiasciurus hudsonicus)*	High	No	No
Black Bear *(Ursus americanus)*	High	Yes	Yes
Brown Bear *(Ursus arctos)*	Low	No	No
Marten *(Martes americana)*	High	Yes	Yes
River otter *(Lutra canadensis)*	High	No	No
Sitka Black-tailed Deer *(Odocoilus hemionus sitkensis)*	High	Yes	Yes

Mountain Goat *(Oreamnus americana)*	Low	No	No
Gray Wolf *(Canis lupus ligoni)*	High	Yes	Yes
Vancouver Canada Goose *(Cygnus buccinator)*	Mod	No	No
Bald Eagle *(Haliaeetus leucocephalus)*	High	No	No
Red-breasted Sapsucker *(Brachyramphus brevirostris)*	High	No	No
Hairy Woodpecker *(Piodoies villosus)*	High	No	No
Brown Creeper *(Certhia americana)*	High	No	No
Others			
Forest Land Birds	High	Yes	No
Moose *(Alces alces)*	High	Yes	Yes

Table 3-19 explains how this analysis dealt with the species list. The humpback whale, Stellar sea lion, Kittlitz's murrelet, yellow-billed loon, Aleutian Tern, Black Oystercatcher and Peale's peregrine falcon may occur in the project area but the potential for measurable effects to the habitat in the analysis area is very low. The trumpeter swan, American osprey, and Queen Charlotte goshawks have a moderate to high probability of occurring in the project area and have a potential for measurable effects to habitat in the analysis area. For more information about these species refer to the Biological Evaluation in Appendix E.

This section discusses the affected environment of species known or suspected to occur in the project area that may be affected by project activities. Rationale for excluding other species from further

discussion in the FEIS is included in Table 3-21. The red squirrel, river otter, brown bear, mountain goat, Vancouver Canada goose, bald eagle, red-breasted sapsucker, hairy woodpecker, and brown creeper will not be analyzed further in this document as they do not have the potential for measurable effects and habitat is provided for by the Forest Plan. Other Forest land birds will not be addressed as these birds are discussed in the report Neo-tropical birds of concern on the Tongass National Forest (Brainard 2008). Harvest activities may have direct or indirect effects on these species. The maintenance of old-growth reserves, old-growth habitat in other non-development LUDs, beach, estuary and riparian buffers, the cavity nester standards and guidelines (USDA 2008), as well as structure left in the stands due to partial harvests will aid in minimizing the cumulative effects to these species. The MIS species that have a high probability of occurrence and may have a high probability for measurable effects to the habitat in the analysis area will be discussed further in this report. These species' habitats are provided for by the Forest Plan in the Standards and Guidelines, the Conservation Strategy, Old-Growth Reserves, estuary buffers, riparian buffers, and beach fringe buffers (which provides for the viability of the species; FSM 2080 R10 TNF Supplement 2000-2007-1).

Methods

The wildlife analysis for this project does not use the deer or marten models. Instead the analysis uses a quantitative approach which looks at the reduction of productive old-growth (POG). POG is defined in the Forest Plan and in the glossary in this document. Looking at the reduction of POG provides a way to measure effects to wildlife and display the amount of habitat that is no longer available to a suite of wildlife species. This approach provides a clear comparison of alternatives.

According to preliminary research conducted by Hanley and Friberg (pers. Comm. Hanley 2009), all Stand Density Model (SDM) categories are not equal (See "Stand Density Model" discussion under Environmental Consequences). They found that grouping the seven Stand Density (SD) classes into three supra-classes made sense statistically for the winter seasons. They placed SD4H in the small tree category because it produces the highest amount of deer forage during winter months (if it is available). The second category they called medium tree, which is composed of SD4S, SD4N, SD5H, SD5S and SD5N. Finally the large tree group, which comprised SD67, produced the lowest amount of winter forage for deer. These three supra-classes make up POG. Hanley's analysis shows that the best winter habitat is comprised of small and medium tree categories and therefore lumping all POG into suitable habitat is consistent with the

best science available to predict alternative effects on deer winter habitat. While looking at the currently available studies on deer in Southeast Alaska, one thing becomes evident; the categories that make the up medium tree class provides good deer winter habitat and grouping the POG together creates a conservative approach to deer habitat during the winter (Schoen and Kirchhoff 1990, Doerr et al. 2005, Farmer et al. 2006 and Schoen and Kirchhoff 2007 found in the Nature Conservancy Publication 2007). The majority of POG habitat in the Central Kupreanof project area is considered winter habitat for deer because of its low elevation.

Field surveys were completed by the Integrated Resource Inventory (IRI) crews during the 2006 and 2007 field seasons. When raptor nests were found, they were buffered according to Forest Plan Standards and Guidelines.

Deer quick cruise plots were recorded in the majority of the unit pool which scores habitat from 0 to 100. Results were analyzed and the habitat with the highest total scores was evaluated to make sure connectivity exists. Connectivity was evaluated in the project area using POG and connectivity will be maintained. See IRI crew survey results in project record.

Looking at the reduction of POG provides a way to measure effects to wildlife as well as to display the amount of habitat that is no longer available to a suite of wildlife species. This approach provides a clear comparison of alternatives. A brief discussion of the relevant species' habitat preferences and requirements is also included.

A road density analysis was also completed. Total road densities for this analysis include open and closed NFS roads as well as any private or State roads within the appropriate boundaries. Road layers of private and State roads may not be complete (for instance mapped Kake Tribal roads may be incomplete) and actually densities may be higher. Municipal roads, for Petersburg and the city of Kake were not included in the calculations.

Affected Environment

Characterization of Wildlife Habitats

The Central Kupreanof project area is located on the interior portion of western Kupreanof Island on the Kake road system. Kupreanof is the sixth largest island in Southeast Alaska and is located near the geographic center of the Alexander Archipelago, a group of mountainous islands lying west of the mainland. The island is approximately 1,089 square miles in size, with 313 miles of shoreline. The community of Kake on the northwestern shore and Kupreanof on the eastern shore are the only two municipalities on the island. The

Central Kupreanof project area is characterized by mostly old-growth temperate forest and wetland plants. Most of the old-growth forest is classified as non-productive forest (Figure 3-2). Young growth forest resulting from timber harvest occurs along the road system and shorelines. Small areas of natural second-growth forest have developed after blow-down has occurred (Figure 3-2).

The forest consists of about 80 percent Western hemlock with lesser amounts of Sitka spruce, mountain hemlock, Alaska yellow-cedar and Western red cedar. Alder grows on exposed and disturbed soil sites such as old roads. Dense understory plants grow where enough sunlight can penetrate the forest canopy. Understory plants include devil's club, rusty menziesia, skunk cabbage, salmonberry, bunch berry and several species of blueberries. The most productive forests develop on well drained sites such as along the mountain slopes of Missionary Range in the northeast, in the Petersburg-Duncan Salt Chuck Wilderness, in the Keku Creek and Big John drainages and in the headwaters of the Castle River drainage.

Kupreanof Island has several large areas of muskeg. The southeast corner of the island and the north central area near the Bohemia Range are mostly muskeg savannas. Muskeg vegetation is a mixture of sedges, deer cabbage, sphagnum mosses, and low growing shrubs such as Labrador tea and bog laurel. Stunted, slow-growing shore pines grow on less saturated muskeg areas. Very small ponds dapple most muskegs.

Due to the low elevations on Kupreanof Island, few areas of subalpine or alpine vegetation exist. The few mountaintops where this habitat is present are the Missionary Range, the Bohemia Range, Portage Mountain and several ridges higher than 1,500 feet in the middle of the island. Plants that grow in subalpine and alpine areas are copperbush sedges, cottongrass, mountain hemlock and several species of blueberries (USDA 2000).

Reference Condition

For this analysis, the reference condition is the historic or original condition and is defined as the habitat condition present before timber cutting began.

Existing Condition

Productive Old-Growth (POG)

Kupreanof Island contains muskeg habitat as well as POG. Within the project area there is approximately 57,628 acres of POG. Within the WAAs (5012, 5013, 5018, 5130, 5131, 5131, and 5132) there are approximately 268,611 acres of POG and within the Biogeographic Province there is approximately 307,710 acres of POG.

Black Bear

Black bear range through all major habitat types found in the project area and require large expanses of habitat. Movements and

distribution of black bear are primarily influenced by food and cover. Black bear are opportunistic omnivores that feed on new shoots, leaves, berries and spawning salmon (late summer and fall). Estuarine, riparian and forested coastal habitats receive the highest use by black bear and have the highest habitat values. Within forested areas, both early and late (old-growth) successional stages provide the best forage and/or cover for black bear. Although many of their preferred foods grow best in openings, bears prefer not to move very far from cover when they are foraging; therefore large openings without cover are thought not to be utilized. From 1998 through 2007 the average harvest in WAAs 5130, 6131, and 5133 has been 28 black bears annually, with the highest harvest of 45 and the lowest harvest of 15 (Meucci 2008). Approximately 79 percent of the annual harvest occurs from nonresidents (Lowell 2005).

Moose

Moose prefer shrubs, timber line plateaus, areas along (glacial riverwash shrub stands) major rivers and post-glacial early successional vegetation types. Moose also prefer shallow ponds where lush vegetation is available. From 1998 through 2007 the average harvest in WAAs 5130, 6131, and 5133 has been 6 moose annually, with the highest harvest of 9 and the lowest harvest of 2 (Meucci 2008).

Marten

Marten are naturally occurring on Mitkof, Kupreanof and Kuiu islands. The subspecies of *Martes caurina* is not known to occur in the project area. This member of the weasel family depends on mature forests with snags and downed logs for denning and prey habitat. The quantity of quality winter habitat is considered the most limiting factor for marten in Southeast Alaska. Due to lower snow accumulations, habitats at lower elevation have higher value for wintering marten.

High volume old-growth coastal habitats (beach fringe) and riparian areas have the highest value, followed by upland habitats between 800 and 1,500 feet in elevation. These stands provide marten with important habitat components, including overstory canopy, snags, fallen logs, trees with large exposed root systems and a lush understory. The fallen logs, decadent trees and large snags in old-growth forests provide marten with important resting microsites. Because marten store little fat, these microsites are important in minimizing thermal loss. Large old trees, standing snags and large diameter logs provide important sites for marten (Suring 1992). Optimum use of habitat occurs when patches of preferred habitat are greater than 180 acres. From 1998 through 2007 the average harvest in WAAs 5130, 6131, and 5133 has been 3 marten annually, with the highest harvest of 9 and the lowest harvest of 0 (Meucci 2008).

Wolf

The Alexander Archipelago wolf ranges through all habitat types found within the project area. A wide-ranging, opportunistic predator, the wolf does not exhibit a preference for specific habitats or habitat characteristics. Wolf presence is more indicative of the availability of habitat for its primary prey species, Sitka black-tailed deer, rather than land form, climate or vegetation (Suring et al 1993 and Person et al. 1996). Person et al. (1997) recommends maintaining sufficient habitat to support at least 18 deer per square mile in areas where deer are the primary prey species. The wolf secondarily preys upon beaver, moose and where available, spawning salmon and waterfowl (Person et al. 1996). Availability of suitable denning habitat is of secondary importance to wolves. Dens are generally located in sites with good drainage and within 10 meters of fresh water (Person et al. 1996).

Wolves tend to have home ranges that cross several wildlife analysis areas. The Forest Plan estimates on average 17 deer per square mile (in the Biogeographic Province) were available in 2008 in the analysis area. Additionally, the Forest Plan predicts approximately 15 deer per square mile (in the Biogeographic Province) will be available in 2095 with the full implementation of the Forest Plan selected alternative (USDA 2008). From 1998 through 2007 the average harvest in WAAs 5130, 6131, and 5133 has been 3 wolves annually, with the highest harvest of 13 and the lowest harvest of 0 (Meucci 2008).

Deer

Sitka black-tailed deer are considered a generalist species that ranges throughout all major habitats of Southeast Alaska. Deer utilize all successional stages at all elevations, including alpine, meadows, and subalpine forests, for most of the year. In the winter, deer prefer low elevation, high volume old-growth forests. The availability of high quality winter range is the most limiting habitat factor to deer.

The capability of winter habitat to support Sitka black-tailed deer is a function of forage abundance and quality (Hanley et al. 1989), snow interception qualities of the overstory and climate as influenced by aspect, elevation and maritime conditions (Suring et al. 1992b). Winter snow conditions affect deer greatly through decreased forage availability and increased energetic costs. Stands with closed canopies minimize the amount of snow accumulation, promoting forage availability and movement of deer. The habitat in the project area is not capable of supporting large numbers of deer because this area on Kupreanof Island lacks large contiguous stands on higher volume timber with high quality browse that deer rely on to provide cover and forage. From 1998 through 2003 the average harvest has been 58 deer annually, with the highest harvest of 110 and the lowest harvest of 18 (Meucci 2008).

Landscape Connectivity

Central Kupreanof is made up of areas of POG and non-forested muskeg. Historic timber sale harvest has occurred in most of the project area. Connectivity is provided by the Conservation Strategy which includes areas of non-development LUDs, beach buffers and Old-Growth Reserve (OGR) system.

Kupreanof Island is a large island compromising of approximately 664,796 acres. The 2008 Forest Plan increased the quality and quantity of the Old-Growth Reserve (OGR) system providing landscape connectivity between non-developmental LUDs and larger old-growth reserves for both animals that use a variety of habitats and endemic mammals. Approximately 102,341 acres on Kupreanof Island are protected in large, medium and small OGRs and a total of 249,798 acres (38%) in non-development LUDs. The Central Kupreanof project area covers approximately 152,517 acres. Up to 3,647 acres (2.4% of the project area) are proposed for harvest with proposed units spread out along the roaded base and logical road extensions. Small OGRs on Kupreanof and specifically within the project area were adjusted during the Forest Plan amendment to provide connectivity across the middle of the island.

Endemics

The Federal Endangered Species Act (ESA) defines endemic as "a species native and confined to a certain region; having comparatively restricted distribution." Forest Plan Standards and Guidelines for endemic mammals direct the Forest to "maintain habitat to support viable populations ands improve knowledge of habitat relationships of rare or endemic terrestrial mammals that may represent unique populations with restricted ranges."

Due to its historic isolation, ecological complexity and narrow distribution between the Pacific Ocean and coastal mountain ranges the North Pacific Coast is considered a "hot spot" of endemism (Cook and MacDonald 2001, Cook et.al. 2006). Southeast Alaska has been found to be a region with an especially high degree of endemism in its small mammal fauna, principally because of the combination of its archipelago geography and its highly dynamic glacial history (Demboski et. al 1998, USDA 2008). In "Conservation of Highly Fragmented Systems: The North Temperate Alexander Archipelago" (Cook et. al. 2006), Kupreanof Island rated relatively low and was not considered a "hot spot" in comparison to other southeast islands.

The following species are known to occur in the project area. common shrew, dusky shrew, red squirrel, beaver, Keen's mouse, long-tailed vole, porcupine, muskrat, wolf, black bear, marten, ermine, mink, wolverine, river otter, mountain lion, Sitka black-tailed deer, moose (MacDonald and Cook 2000).

3 Environment and Effects

Central Kupreanof Timber Harvest
Figure 3-2
Vegetation

Legend
- Old-growth Reserve
- 1000ft Shore Buffer
- Non-development LUD
- Wilderness
- Unit Pool
- Productive Old-growth
- Forested Non-productive
- Managed Stands
- Project Area Boundary

Duncan Canal

Rocky Pass

c:/workspace/ckupre/plots/deis/fig3_2_vegetation.mxd 09-20-08 EP

Environmental Consequences

Units of Measure and Areas of Analysis

Wildlife use an assortment of habitats including POG and non-forest structures. Because the proposed activities primarily alter POG, the effects of timber harvest on wildlife habitat will be analyzed by comparing changes in POG using the Size Density Model (SDM). The analysis includes comparisons of changes between past, present and foreseeable future habitat capability by alternative.

Wildlife was analyzed at three different landscape scales: project area, WAAs, and biogoegraphic province (Kupreanof/Mitkof). The project area analysis provides the localized and direct/indirect effects of timber harvest on POG. Cumulative effects impacts were analyzed at both multiple WAA and the Biogeographic Province scales. Multiple WAAs (5012, 5013, 5018, 5132, 5131, 5133 and 5130) were analyzed for cumulative effects to provide a reference of the impacts at a smaller scale than the Biogeographic Province but larger than the project scale. The northern part of Kuiu Island (WAAs 5012, 5013 and 5018) was included in the Central Kupreanof Analysis because it is possible for animals to move to this area if individuals are displaced from the project area.

Kuiu is also considered part of the customary and traditional use area for the people of Kake and activities in these seven WAAs may interact together to affect subsistence resource uses. Finally, home ranges may include areas as large as the Biogeographic Province. The 2008 Tongass Land and Resource Management Plan displays the distribution of existing POG acres by Stand Density Model (SDM) category for the Kupreanof/Mitkof Biogeographic Province. This analysis tiers to the Forest Plan and displays the reduction of POG acres by SDM (and as a percent reduction) for each alternative.

Size Density Model

The following excerpts are from the 2008 Forest Plan and describe the Size Density Model.

For the 1997 Forest Plan, the Tongass classified POG on the basis of three volume strata (low, medium and high). These were refined based on using the existing TIMTYP inventory, soils and slopes. Since the issuance of the 1997 Forest Plan, several landscape and timber sale analyses have effectively used the three broad timber-type categories delineating non-forest, unproductive old-growth forest, and POG forest lands, which were divided further into high, medium, and low volume strata forest stands (USDA 2008).

While the three volume strata approach for POG is useful for estimating timber volume for forest planning purposes, it is not as useful for describing other important forest elements, including forest

structure, ecosystem diversity and wildlife habitat. Forest structure is defined as the spatial arrangement of the components of vegetation and is a function of tree size and height, vertical stratification into layers, and horizontal spacing of trees. It is important because it reflects the complex spatial and temporal interaction between plant growth (e.g., dispersal and competition), physiographic factors (e.g., geology, soils, slope, aspect, and elevation), climate, and disturbance, (e.g., wind, landslides, and human activities). Areas of high-structure habitat are typically located in areas of well-drained soils on unconsolidated sediments associated with alluvial fans, floodplains, or toe slopes.

Differences in forest structure are more useful because timber volume may be misleading when describing wildlife habitat or other attributes of the stand. For example, two stands may have the same volume but one may be a dense stand of medium-sized trees with a single canopy layer while the other stand may be a combination of widely-spaced large over story trees and two or three lower canopy layers containing small and medium sized trees (Caouette et. al. 2000, Caouette and DeGayner 2001).

To move beyond the limitations of timber volume, Forest Service managers and planners have begun to revise and refine forest mapping on the Tongass by creating a tree size and density mapping model for POG forests. Such information is more applicable for assessing conservation of biodiversity, estimating timber values and developing wildlife habitat models.

One alternative to using volume estimates is using a combination of two common forest measurements: tree sizes and tree densities (Caouette et. al. 2000). These two measures provide a more comprehensive forest measuring system than timber volume (Spies and Franklin 1991, Franklin 1995). The Forest Service recently published National Guidance on vegetation classification and mapping that specifically requires tree sizes (expressed as quadratic mean diameter of all live dominant/co-dominant trees) and tree densities (expressed as canopy closure) for the mapping of forest structure (USDA Forest Service 2004d). The Tongass National Forest has developed an approach that uses these two measurements to model structural diversity in order to better define and describe forest structural attributes (Caouette and DeGayner 2005). This model has proven to be the best tool for representing these other forest elements (USDA 2008).

Size-density model (SDM) uses timber volume class, hydric soil class and aspect to characterize forest structure. These attributes were correlated with the stand density index and mean quadratic mean to derive the various SDM categories (USDA 2008).

As the SDM is used, it is expected the limitations will become evident. Much of the SDM is based in theory and the results have not been verified for all areas. As more information is gathered, improvements may be made. This analysis collapsed the SDM to the basic level of POG .

Differences in Forest Plan Predictions of Available Deer Habitat and Project Planning

The SDM layer that is used for this analysis displays different results than the SDM strata that were used in the 2008 Forest Plan. There appears to be between a 2 to 4 percent difference in the numbers generated. This difference appears to be due to the more precise information that is utilized at the project level compared to the broad scale information used at the Forest level. This difference is expected.

Direct and Indirect Effects

Effects Common to all Action Alternatives

Removal of stream crossings and closures of roads may benefit wildlife by limiting road densities and motorized human access. Vegetation treatments (proposed thinning) should benefit wildlife as it helps to restore side lighting to the forest floor, increasing the production of forbes and shrubs as well as helping to promote taller and denser stands of trees that can provide shelter (snow interception). Projects involving recreation may not benefit wildlife as the projects may increase access (improving trails) or encourage people to gather (camp sites, shelters). These projects may not harm wildlife directly but may encourage people to be in the area who may indirectly take wildlife as part of their experience or opportunity.

Microsales are planned to occur in the project area on Roads 6030, 6040, 6314, 6314s, 6326, 328, 6334, 6336, 6339 and 6367. If a Microsale is requested a site specific survey will be conducted. These sales are not expected to adversely affect wildlife in the project area.

Table 3-20. Reduction of Productive Old-Growth Habitat

	Alternatives			
	1	**2**	**3**	**4**
Acres of POG Habitat Harvested	0	2,427	3,568	1,261
Percent Change from Current Condition within Project Area (57,628 acres of POG)	0%	4.2%	6.2%	2.2%
Percent Change from Current Condition (2008) within WAAs (269,593 Acres of POG)	0%	0.9%	1.3%	0.5%
Percent Change From Current Condition (2008) within Biogeographic Province (307,710 acres of POG)	0%	0.8%	1.2%	0.4%

Project Area

Alternative 1

This alternative proposes no new activities in the Central Kupreanof project area. Currently there are approximately 57,628 acres of POG, within the project area. The area displayed in this project area analysis is different than the area displayed by other resources (timber economics, Silviculture) because this POG analysis used SDM and the other resources used volume strata. Volume strata define some areas as POG where SDM describes that same habitat as "non-forested." As a result, acres of POG are slightly different.

Wildlife habitat may decline as current second-growth stands regenerate and the under story forage is shaded. There will be no change in the current road network by these actions; however, maintenance activities would continue. This alternative will have no affect on wildlife habitat.

Alternative 2

This alternative would directly affect approximately 2,427 acres of POG. This would be about 4.2 percent of the project area POG and 0.8 percent of the available POG in the Biogeographic Province. This reduction may have an effect on individuals but will not affect wildlife populations. The reduction of habitat capability is considered to be minor because of the remaining POG habitat. The remaining 95.8 percent of the project area POG would remain unaffected by proposed activities. Part of this remaining habitat is made up of non-developmental LUDS including riparian corridors and beach fringe. Also, areas of partial harvest can be used by wildlife as habitat.

Alternative 3

This alternative proposes to harvest 3,568 acres of POG in the Central Kupreanof Project Area. This would be a reduction of approximately 6.2 percent of POG within the project area and 1.2 percent of POG within the Biogeographic Province. This reduction may have an effect on individuals but will not affect wildlife populations. The reduction of habitat capability is considered to be minor because of the remaining POG habitat. The remaining 93.8 percent of the project area POG would remain unaffected by proposed activities. Part of this remaining habitat is made up of non-developmental LUDS including riparian corridors and beach fringe. Also, areas of partial harvest can be used by wildlife as habitat.

Alternative 4

This alternative proposes to harvest 1,261 acres of POG in the Central Kupreanof Project Area. This would be a reduction of approximately 2.2 percent of POG within the project area and 0.4 percent of POG within the Biogeographic Province. This reduction may have an effect on individuals but will not affect wildlife populations. The reduction of habitat capability is considered to be minor because of the remaining POG habitat. The remaining 97.8 percent of the project area POG would remain unaffected by proposed activities. Part of this remaining habitat is made up of non-developmental LUDS including riparian corridors and beach fringe.

Black Bear

Black Bear habitat is provided for by Forest Wide Standards and Guidelines, Conservation Strategy, Old-growth reserves and beach buffers. This project may impact part of their habitat due to road building and associated timber harvest activities. The impacts will be inconsequential as bear are generalists (an organism or species with a very broad ecological niche, which can tolerate a wide range of environmental conditions and eat a variety of foods) as a result they are capable of using a variety of habitats and are not exclusively dependent on productive old-growth (POG). Therefore, the reduction of POG habitat to all action alternatives will not have effect to black bear populations. Depending upon which alternative is selected at least 93.8 percent of POG habitat will remain within the project area.

Moose

Moose habitat is provided for by Forest Wide Standards and Guidelines, Conservation Strategy, Old-Growth Reserves and beach buffers. This project may impact part of their habitat but the impacts will be inconsequential as moose are generalists and do not rely on POG exclusively. Therefore, the reduction of POG habitat to all action alternatives will not have an effect on moose populations. Depending upon which alternative is selected at least 93.8 percent of POG habitat will remain within the project area.

Marten

While there may be localized effects from road building and timber harvest, and some individual marten may be displaced, there is not an anticipated effect to the marten population. Marten populations are

sensitive to overexploitation for trapping. Currently the open road density in the project area is 0.27 miles/miles^2 and the total road density is 0.33 miles/miles^2. Table 3-21 displays road densities for the project area and Kupreanof Island. Road building will increase motorized vehicle access during the timber sale and for an additional five to ten years after the sale. Marten and their highest value habitat are provided for by Forest-wide standards and guidelines, conservation strategy, old-growth reserves and beach buffers. Marten may be affected at a level that does not influence their habitat. Because of the conservation strategy marten are well above the status of maintaining viability in the population. Therefore, the reduction of POG habitat to all action alternatives will not have an effect to marten populations. Depending upon which alternative is selected at least 93.8 percent of POG habitat will remain within the project area.

Wolf

Wolves are protected by Forest-wide standards and guidelines, conservation strategy, old-growth reserves, and beach buffers. Wolves tend to have home ranges that cross several wildlife analysis areas. The 2008 Forest Plan estimates an average of 17 deer per square mile (in the Biogeographic Province) are currently available.

The Forest Plan states, on page 3-283: "The Wolf guideline is intended to apply to Biogeographic Provinces where deer are the primary prey of wolves. Thus, the number of WAAs that appear to fall below 18 deer per square mile in terms of habitat capability is inflated because many either do not naturally contain much suitable deer habitat (sic Kupreanof Island), or are areas where wolves also prey heavily on species other than deer such as moose, beaver or mountain goats." The Forest Plan goes further and states that there is a "high likelihood of sustaining persistent core wolf populations and reducing risks to long-term viability in the two principal areas of concern in Southeast Alaska (GMU 2 and 3) as well as the remainder of the historic wolf range on the Tongass".

The Forest Plan predicts 15 deer per square mile (in the Biogeographic Province) will be available in 2095 with the full implementation of the Forest Plan selected alternative (USDA 2008). The habitat within the Central Kupreanof Timber Harvest project area is not capable of supporting large numbers of deer. With implementation of any action alternative, deer would still average between 17 and 15 deer per square mile.

Currently the open road density in the project area is 0.27 miles/miles^2 and the total road density is 0.33 miles/miles^2. Table 3-21 displays road densities for the project area and Kupreanof Island. Increased road building may provide additional access for hunters/trappers. This project may impact part of their habitat but the impacts will be inconsequential as wolves are generalists and do not utilize POG

exclusively. Therefore, the reduction of POG habitat to all action alternatives will not have an effect to wolf populations. Depending upon which alternative is selected at least 93.8 percent of POG habitat will remain within the project area.

Table 3-21. Road Densities

Road densities (mi/mi^2)	Alt 1	Alt 2	Alt 3	Alt 4
Project Area Open Road	0.27	0.31	0.41	0.28
Project Area Total Road	0.33	0.36	0.44	0.33
Kupreanof Island Total Road[1]	0.22	0.23	0.25	0.22

[1] Displays cumulative road densities (including foreseeable future activities). Calculations include both open and closed NFS roads as well as State and available mapped private roads.

Sitka Black-tail Deer

According to Hanley and Friberg (personal communication 2009), all SDM categories are not equal. They found that grouping the seven SD classes into three supra-classes made sense statistically for the winter seasons. They placed SD4H in the small tree category because it produces the highest amount of deer forage during winter months (if it is available). The second category they called medium tree, which is composed of SD4S, SD4N, SD5H, SD5S and SD5N. Finally the large tree group, which comprised SD67, produced the lowest amount of winter forage for deer. These three supra-classes make up POG. Hanley's analysis shows that the best winter habitat is comprised of small and medium tree categories and therefore lumping all POG into suitable habitat is consistent with the best science available to predict alternative effects on deer winter habitat. While looking at the currently available studies on deer in Southeast Alaska, one thing becomes evident; the categories that make the up medium tree class provides good deer winter habitat and grouping the POG together creates a conservative approach to deer habitat during the winter (Schoen and Kirchhoff 1990, Doerr et al. 2005, Farmer et al. 2006 and Schoen and Kirchhoff 2007 found in the Nature Conservancy Publication 2007). This analysis tiers to the Forest Plan Standards and Guidelines that require the consideration of Sitka black-tailed deer habitat needs as part of project analysis. As such, the reduction of POG habitat was used to analyze effects of all action alternatives.

The effects of proposed activities on POG are analyzed. Deer habitat is provided for by Forest-wide Standards and Guidelines, Conservation Strategy, Old-growth reserves and beach buffers. This project may

impact deer habitat and individual deer will be affected but the viability of the deer population is not in question. At most 6.2 percent of the POG may be removed which will leave 93.8 percent of POG habitat remaining for the deer to utilize within the project area.

Landscape Connectivity

Landscape connectivity is maintained by non-development LUDs, OGRs and beach fringe areas. During the Forest Plan amendment, small OGRs were reevaluated and the OGRs within the project area adjusted to better maintain connectivity across the island. According to the conservation strategy, these adjustments provide for landscape connectivity (FP FEIS, Appendix D). Additionally, connectivity was addressed within the project area by looking at the results of the deer quick cruise plots. Additional consideration for connectivity was part of the proposed action's design. The areas with the higher total group of quick cruise plot scores were buffered by either a no cut buffer or silvicultural prescription to make sure there was additional connectivity across the planning area. Forest Plan Standards and Guidelines are met with this analysis.

Direct effects on landscape connectivity would be greatest with implementation of Alternative 3 because harvest of proposed Unit 315 could have impacts on deer movement through the corridor across Kupreanof Island. Alternative 2 provides 50 percent retention in Unit 315 and Alternative 4 does not harvest this unit. All action alternatives maintain connectivity in the project area.

Endemics

Species that are associated with old-growth would be affected by the harvest old-growth. Species associated with primarily non-POG habitat would not be affected with the exception of non-forested habitat associated with roads and turnouts. Old-growth habitat is being removed causing a change at the stand level. This change will remove cover and possible habitat for small mammals they may be exposed to a greater degree to predation. The increased side light may provide an increase in vegetation that may benefit small mammals. However, landscape connectivity is maintained and, depending upon which alternative is selected, at least 93.8 percent of POG habitat will remain within the Project Area.

Cumulative Effects

Biogeographic Province

The cumulative effects analysis area for POG habitat is the Biogeographic Province. The province was selected as the analysis landscape scale since it is the scale used by animals with large home ranges and is the same scale used for analysis of POG in the Forest Plan. Approximately 51 percent of the province was originally POG forest. Historic harvest has reduced POG by 28 percent in the Biogeographic Province since the reference condition. The Kupreanof/Mitkof Biogeographic Province includes Native

Corporation lands near Kake as well as other private lands. Due to lack of information about these Corporation lands, it is assumed all lands available were clearcut harvested. It was also assumed all lands were POG prior to harvest. Due to these assumptions, the amount of habitat converted to young growth will be overestimated as will the impacts to wildlife habitat where harvest has occurred. However, this will allow a reasonable estimate of the reduction of POG in the absence of data.

In addition to the reduction in habitat on private lands, the analysis also includes those lands that are or will be harvested in other timber sales; including Bocephus, Scott Peak, Lindenberg, Finger Point, Overlook, and Woodpecker timber sales, and Kake small sales. Assuming these sales harvest the volume available, there would be another approximately 1 percent reduction in POG habitat for a total decrease of approximately 29 percent in the Biogeographic Province.

Timber sales are planned for the Tonka area in the near future. A detailed analysis of these effects will take place in the planning process before any action occurs. Projects Common to all Action Alternatives would not contribute to overall cumulative effects to POG habitat. The catalogs of events for Kupreanof and Mitkof islands were reviewed.

The conclusions in this analysis are consistent with the 2008 Forest Plan. The Forest Plan estimates that in 100 years (2105) with implementation of Alternative 6, the Kupreanof/Mitkof Biogeographic Province 10 will retain 61 percent of the original POG acres on all land ownerships. The Forest Plan estimates that 39 percent of the POG in the province will be harvested (USDA 2008).

Alternative 1

This alternative proposes no new activities in the Central Kupreanof Project Area. No harvest or road building would occur within the project. Wildlife habitat may decline as current second-growth stands regenerate and the understory forage is shaded. There will be no change in the current road network by this action; however, the District-wide Access Travel Management (ATM) Environmental Assessment (EA) will analyze road management objectives for the Biogeographic Province. The ATM EA is expected to change access and open road densities. Current road maintenance will continue. Old-growth stands with POG would continue to support wildlife at their current capability at least until the next planning cycle. Historic/original harvest has reduced POG by approximately 28 percent in the Biogeographic Province. Cumulatively, including the reasonable foreseeable reduction of POG on Forest Service and non-Forest Service lands, there would be approximately a total of 29 percent reduction of POG from the historic/original condition within the Biogeographic Province.

Alternative 2

There would be a cumulative reduction of 29.8 percent of the POG within the Biogeographic Province with implementation of this alternative. This reduction in habitat due to the action alternative is not expected to affect wildlife populations.

Alternative 3

There would be a cumulative reduction of approximately 30.2 percent of the POG within the Biogeographic Province with implementation of this alternative. This reduction in habitat is not expected to affect wildlife populations.

Alternative 4

There would be a cumulative reduction of approximately 29.4 percent of the POG within the Biogeographic Province with implementation of this alternative. This reduction in habitat due to the action alternative is not expected to affect wildlife populations.

Multiple WAAs

Cumulative effects were also analyzed at multiple WAAs as this level is more appropriate to analyze the effect of subsistence use. Seven WAAs were analyzed as an area. Three WAAs are on Kuiu (5012, 5013, and 5018) and four WAAs include the project area and adjacent lands on Kupreanof Island (5030, 5031, 5032, and 5033). Historic harvest has reduced POG by approximately 25 percent in these WAAs from original condition. This analysis includes Native Corporation lands near Kake as well as other private lands. Due to lack of information about these Corporation lands, it is assumed all lands available were clearcut harvested. It was also assumed all lands were POG prior to harvest. Due to these assumptions, the amount of habitat converted to young growth will be overestimated as will the impacts to wildlife habitat where harvest has occurred. However, this will allow a reasonable estimate of the reduction of POG in the absence of data.

In addition to the reduction in habitat on private lands, the analysis also includes those lands that may be harvested in other timber sales; including the sales at Kuiu and remaining Crane and Rowan Mountain units. Small timber sales are planned along road 6367 in the near future. Two units are proposed that would harvest up to 50,000 board feet. This removal of POG would not be measurable to the scale of this proposed action. Projects Common to All Action Alternatives would not contribute to overall cumulative effects to POG habitat. The catalogs of events for Kuiu and Kupreanof Islands were referenced in this analysis.

Alternative 1

This alternative proposes no new activities in the Central Kupreanof Project Area. No harvest or road building would occur within the project area. Wildlife habitat may decline as current second-growth stands regenerate and the understory forage is shaded. There will be no change in the current road network by this action; however, the PRD Access Travel Management (ATM) EA will analyze road management objectives for the Biogeographic Province. The ATM EA is expected to change access and open road densities. Current road

maintenance will continue. Old-growth stands with POG would continue to support wildlife at their current capability at least until the next planning cycle. Historic/original harvest has reduced POG by approximately 25 percent in the WAAs. Cumulatively, including the reasonable foreseeable reduction of POG on Forest Service and non-Forest Service lands, there would be approximately a 26 percent reduction of POG from the historical/original condition within the WAAs.

Alternative 2

There would be a cumulative reduction of 26.9 percent of POG within the WAAs with implementation of this alternative. This reduction in habitat due to the action alternative is not expected to affect wildlife populations.

Alternative 3

There would be a cumulative reduction of approximately 27.3 percent of POG within the WAAs with implementation of this alternative. This reduction in habitat due to the action alternative is not expected to affect wildlife populations.

Alternative 4

There would be a cumulative reduction of approximately 26.5 percent of POG within the WAAs with implementation of this alternative. This reduction in habitat due to the action alternative is not expected to affect wildlife populations.

Table 3-22. Cumulative Reduction of POG within the Biogeographic Province and WAA

	Alternatives				
	Current Condition	**1**	**2**	**3**	**4**
Percent Cumulative Reduction From Historic/Original Condition Biogeographic Province (431,217 acres of POG)	-28%	-29%	-29.8%	-30.2%	-29.4%
Percent Cumulative Reduction From Historic/Original Condition Multiple WAAs (359,445 acres of POG)	-25%	-26%	-26.9%	-27.3%	-26.5%

Black Bear

When an analysis was conducted at the multiple WAA for cumulative effects the percent change ranged from 1 to 2.3 percent and 1 to 2.2 percent respectively in the multiple WAAs, and in the reduction of POG depending on alternative. Approximately 72.7 percent of the

multiple WAA POG and 69.2 percent of the POG in the Biogeographic Province would remain unaffected. Plus, habitat areas are provided for by the conservation strategy (which includes OGRs, beach buffers, the matrix and other non-development LUDS that protects additional habitat). This project meets Forest Plan Standards and Guidelines.

Moose

When an analysis was conducted at the multiple WAA for cumulative effects the percent change ranged from 1 to 2.3 percent and 1 to 2.2 percent respectively in the multiple WAAs, and in the reduction of POG depending on alternative. Approximately 72.7 percent of the multiple WAA POG and 69.2 percent of the POG in the Biogeographic Province would remain unaffected. Plus, habitat areas are provided for by the conservation strategy (which includes OGRs, beach buffers, the matrix and other non-development LUDS that protects additional habitat). This project meets Forest Plan Standards and Guidelines.

Marten

While there may be localized effects from road building and timber harvest, and some individual marten may be displaced, there is not an anticipated effect to the marten population. Marten may be affected at a level that does not influence use of this habitat. Because of the conservation strategy viability of the population will be maintained.

When an analysis was conducted at the multiple WAA for cumulative effects the percent change ranged from 1 to 2.3 percent and 1 to 2.2 percent respectively in the multiple WAAs, and in the reduction of POG depending on alternative. Approximately 72.7 percent of the multiple WAA POG and 69.2 percent of the POG in the Biogeographic Province would remain unaffected. Plus, habitat areas are provided for by the conservation strategy (which includes OGRs, beach buffers, the matrix and other non-development LUDS that protects additional habitat). This project meets Forest Plan Standards and Guidelines.

Gray Wolf

When an analysis was conducted at the multiple WAA for cumulative effects the percent change ranged from 1 to 2.3 percent and 1 to 2.2 percent respectively in the multiple WAAs, and in the reduction of POG depending on alternative. Approximately 72.7 percent of the multiple WAA POG and 69.2 percent of the POG in the Biogeographic Province would remain unaffected. Plus, habitat areas are provided for by the conservation strategy (which includes OGRs, beach buffers, the matrix and other non-development LUDS that protects additional habitat). This project meets Forest Plan Standards and Guidelines and remains within Forest Plan predictions.

Sitka Black-tail Deer

When an analysis was conducted at the multiple WAA for cumulative effects the percent change ranged from 1 to 2.3 percent and 1 to 2.2 percent respectively in the multiple WAAs, and in the reduction of

POG depending on alternative. Approximately 72.7 percent of the multiple WAA POG and 69.2 percent of the POG in the Biogeographic Province would remain unaffected. Plus, habitat areas are provided for by the conservation strategy (which includes OGRs, beach buffers, the matrix and other non-development LUDS that protects additional habitat). This project meets Forest Plan Standards and Guidelines.

Landscape Connectivity

When an analysis was conducted at the multiple WAA for cumulative effects the percent change ranged from 1 to 2.3 percent and 1 to 2.2 percent respectively in the multiple WAAs, and in the reduction of POG depending on alternative. Approximately 72.7 percent of the multiple WAA POG and 69.2 percent of the POG in the Biogeographic Province would remain unaffected. Landscape connectivity is maintained by the existence of non-development LUDs, OGRs and beach fringe areas. During the Forest Plan amendment, small OGRs were re-evaluated and the OGRs within the project area adjusted to better maintain connectivity across the island. According to the conservation strategy, these adjustments provide for landscape connectivity (Forest Plan FEIS, Appendix D). When looked at the multiple WAA level, the cumulative reduction of POG habitat is lower than when POG is displayed at the project scale (this is due to the larger scale). This project meets Forest Plan Standards and Guidelines. Connectivity is maintained in the project area and across the landscape.

Endemics

When an analysis was conducted at the multiple WAA for cumulative effects the percent change ranged from 1 to 2.3 percent and 1 to 2.2 percent respectively in the multiple WAAs, and in the reduction of POG depending on alternative. Approximately 72.7 percent of the multiple WAA POG and 69.2 percent of the POG in the Biogeographic Province would remain unaffected. Species that are associated with old-growth would be affected because of the harvest of old-growth (see POG analysis). Removing old-growth habitat causes a change at the stand level and would be lessened at the multiple WAA or Biogeographic Province level. This change would remove cover and possible habitat for small mammals and they may be exposed to a greater degree of predation. The increased side light may provide an increase in vegetation that may benefit small mammals. Connectivity was considered and is maintained within the project area and across the landscape. Forest Plan standard and guides are met with this analysis.

Conclusion

These actions would affect wildlife habitat differently depending on the amount and type of POG removed. Alternative 1 would not remove any POG and would have the least impact to wildlife habitat.

Alternative 4 would remove the second lowest amount of POG from the area. Alternatives 2 would remove the third lowest amount of POG from the area and Alternative 3 would remove the most POG from the project area having the greatest impact to wildlife habitat. The action alternatives would remove approximately 1.3 percent or less of the POG habitat in both the WAAs and the Biogeographic Province. This reduction is not expected to affect wildlife populations.

Cumulative impacts would be slightly higher due to the amount of harvest on other Forest Service and non-Forest Service lands. The reduction of POG due to the action alternatives is still considered low and is not expected to impact wildlife habitat.

All applicable Forest Plan Standards and Guidelines were met for this analysis. This analysis is in compliance with all direction, policies and regulations. Notice was given to appropriate federal and state agencies, local committees, recognized tribal governments.

Subsistence

Communities Traditionally Using the Central Kupreanof Project Area

The Forest Plan FEIS includes maps of "community use areas" for each of the 32 communities in Southeast Alaska. These maps indicate the approximate extent of the areas that are commonly used by many of the residents of each community in their day-to-day work, recreational, and subsistence activities.

The Central Kupreanof project area is within part of Kake's community use area (Forest Plan FEIS Part 2, page 3-585) and adjacent to Petersburg's and Kupreanof's community use areas (Forest Plan FEIS Part 2, page 3-623).

Kake and Petersburg residents are known to use the project area more than residents of other communities in Southeast Alaska. This opportunity is due to easy access to Central Kupreanof provided by the existing road system. Some subsistence activities these residents engage in include fishing, deer, bear, moose and waterfowl hunting and gathering of shellfish and berries. Traditional Native subsistence use also includes gathering medicinal plants, seaweed, spruce roots and cedar bark.

For a detailed discussion of the communities of Kake and Petersburg see the Timber Economics section in this chapter and "Community Profiles: Kake, Petersburg, Alaska and Environmental Justice" in the project record.

Subsistence Use

Kake

The 1988 Tongass Resource Use Cooperative Survey (TRUCS) study found that deer accounted for 24 percent of the total edible pounds of subsistence resources harvested by Kake households (Kruse and Frazier 1988). Deer accounted for 28 percent of per capita subsistence harvest by Kake residents in 1996 (ADF&G 2006).

Kake residents harvest deer on Admiralty Island and Kupreanof Island, which are included in Game Management Unit (GMU) 4 and GMU 3 respectively. Deer harvest in GMU 4 is considered very high relative to other areas of Southeast Alaska, which is indicative of relatively high deer populations. Over 1997-2004, there has been no significant trend in the number of deer harvested or in the number of hunters (ADF&G 2005). Deer harvest in GMU 3 declined from 1998-2002 and increased between 2002 and 2004. The number of deer hunters

declined from 2000-2002 and slightly between 2002 and 2004 (ADF&G). This is consistent with Kake's human population, which increased from 1970 to 1990, stayed relatively constant between 1990 and 2000, and decreased from 2000 to 2005. In conversations with residents of Kake in 2009, Kake has an estimated population of 519.

Five WAAs accounted for the majority (76 percent) of deer harvested by Kake residents. Three of the five WAAs of greatest importance to Kake hunters (WAAs 3939, 3940 and 4041) occur at the south end of Admiralty Island. They are currently unroaded and there are no plans for future road development in these areas. The other two WAAs of importance to Kake hunters (WAAs 5131 and 5132) are located surrounding or adjacent to the community on Kupreanof Island. The Kake portion ranges from about 19 percent (WAA 3939) to 91 percent (WAA 5131) of the total harvest and from 21 percent to 100 percent of the rural hunter harvest in the WAAs. About 7 percent of the combined harvest in these WAAs is by non-rural hunters, suggesting that there is a small harvest buffer that could be restricted, if necessary, before restrictions are placed on rural harvest.

It is recognized that the while Admiralty Island and Kupreanof Island represent areas where the majority of deer are harvested, important traditional and customary use areas of the Organized Village of Kake also include Kuiu Island and the eastern shores of Baranof Island (Goldschmidt and Haas, 1998). Some subsistence uses continue to occur on Kuiu. It is also acknowledged that as deer populations have decreased on Kuiu and Kupreanof islands. Admiralty has become more important particularly for subsistence deer harvest. However, access to Admiralty during the winter hunting season is often difficult for residents of Kake. Kake residents have stated that Admiralty Island is not their preference for deer hunting and that if deer numbers increase on Kuiu and Kupreanof Islands, more of their hunting will shift back to these areas.

Petersburg

Salmon, other finfish and invertebrate resources account for 52 percent of the total edible pounds of subsistence resources harvested by Petersburg households (Kruse and Frazier, 1988). Marine resources (fish and marine invertebrates) accounted for 65 percent of per capita subsistence harvest in Petersburg in 1987.

The 1988 TRUCS study found that deer accounted for 21 percent of the total edible pounds of subsistence resources harvested by Petersburg households (Kruse and Frazier, 1988). Deer accounted for 22 percent of per capita subsistence harvest by Petersburg residents in 1987 (ADF&G 2006).

Petersburg residents harvested on and around Mitkof and Kupreanof Islands, with the majority of harvest occurring with in GMUs 3 and 4. Deer harvest in GMU 3 declined from1998-2002 and increased in

2002-2004. The number of deer hunters declined from 1998-2002 and increased in 2002-2004 (ADF&G 20005). Deer harvest in GMU 4 is considered very high relative to other areas of Southeast Alaska, which is indicative of relatively high deer population (ADF&G 2005). Over 1997-2004, there has been no significant trend in the number of deer harvested or in the number of hunters (ADF&G 2005). The human population of Petersburg declined approximately 2 percent between 2000 and 2005. In 2005, Petersburg had an estimated human population of 3,155.

Units of Measure and Areas of Analysis

The Subsistence analysis looks at the effects to wildlife habitat (referencing the POG analysis completed in the Wildlife section in this chapter), the effects to fish habitat and marine environment (referencing the Fisheries and Watershed section in this Chapter), and the effects to food plants. Additional analysis for changes in access (miles of new NFS roads) to subsistence resources is included in this section.

Direct, Indirect and Cumulative Effects to Resources

Wildlife Habitat

The Wildlife section talks about wildlife species, such as black bear, wolf, deer and marten. The effects of timber harvest on wildlife habitat were analyzed by comparing changes in Productive Old-Growth (POG) using the Size Density Model (SDM). The analysis included comparisons of changes between past, present and foreseeable future habitat capability by alternative. This analysis is found in the Wildlife section of this chapter and in the Wildlife Resource Report located in the project record.

Based on that analysis, there is not expected to be a significant affect or possibility of a significant restriction on black bear, wolf, moose, furbearers, or upland birds or waterfowl resources within the project area. Recently, the marten trapping season was closed on Kuiu Island and is currently being proposed for additional closure to the Federal Subsistence Board. This closure is based on recent low study results and concluded low marten populations. The reason for these suspected low population numbers has not been studied.

Although there has been a recent closure of marten trapping on Kuiu Island, based on the POG analysis for marten in the Wildlife section of Chapter 3 there is no significant possibility of a significant restriction resulting from cumulative effects in the project area, or Biogeographic Province analysis areas due to federal activities.

Deer

Deer populations in Southeast Alaska live at the edge of the species range. The Sitka black-tailed deer is a smaller form of mule deer that live in the forests of Alexander Archipelago. Food is not a limiting factor in deer survival here but available food, especially during winter months, can be limited by snow depth.

Southeast Alaska lies along the coastal mainland in this archipelago. Saltwater influence is readily apparent. Because of this, snow conditions differ from what one would expect in other mule deer habitats. Constant warming and cooling, caused by the relatively warm marine climate, allows the snowpack to create a hard crust that deer are able to walk on. While it covers the forbs (generally a snow depth of greater than 7 inches or 20 cm) it enables the deer to reach higher browse plants and arboreal lichens to augment their diets.

Following a severe winter these new plant shoots are extremely important to deer, without them they will starve very rapidly. Conditions leading to this condition occur in Southeast Alaska about every 20 or so years.

The last time there was a catastrophic winter event that killed large numbers of deer was during the winter of 1971-72. That year total snow accumulation was 221.6 inches at the Petersburg Airport. This large amount of snow caused problems for the deer but the real problem was the persistence of the snow. There was a snow depth greater than 7 inches for 156 consecutive days starting in November and carrying into May (Brainard 2008). This event caused many deer to die, the population numbers literally crashing. As a result, the hunting season on Kuiu and Kupreanof were closed from 1975 to 1991.

It is also important to understand that the wolf eradication programs (poison drops and unlimited hunting/trapping) came to an end in 1968 just before the severe winter. Wolf populations grew and contributed to the slow recovery of the deer population from 1975 to 1991. Wolf predation continues to retard deer population recovery. However, it is believed that deer population numbers before the severe winters in the early 1970s were artificially high (because of such programs as wolf eradication) and exceeded habitat capability. It is concluded then that population numbers will never reach those levels regardless of federal activities (Brainard 1996). Kake residents have stated that as populations increase on both Kuiu and Kupreanof, more and more of their hunting will shift back to these areas.

This severe winter event happened before large scale road building and timber harvest occurred in the project area. Deer mortality is often considered to be caused by timber harvest activity but in reality deer

die across the forest due to severe winter conditions. Deer live on the edge of their range in this cold and wet climate. Every couple of decades harsh winters cause deer to die due to the lack of forage covered by the deep snow.

Based on the POG wildlife habitat analysis (Wildlife section in Chapter 3), and the reduction of up to 1.3 percent of POG in the multiple WAAs, subsistence use of deer by Kake and Petersburg residents is not anticipated to be significantly affected by any of the action alternatives. In terms of cumulative effects, this project is not expected to affect subsistence use of deer in the reasonable foreseeable future to the point that some restriction in hunting might be necessary. However, the Forest Plan does determine that with full implementation of the plan over the long term, a significant possibility of a significant restriction on the subsistence use of deer exists on the Forest. The Forest Plan (FEIS 3-631) also predicts that there should be sufficient habitat capability for deer hunted in the Kake community use area by Kake residents and all rural hunters (the restriction affecting non-rural and non-resident hunters first). The risk of hunting restrictions would be reduced somewhat, through more intensive management (e.g. thinning) of the existing and future closed-canopy, young-growth forest in the area.

Fish and Marine Invertebrates

No significant effect of salmon, other finfish or invertebrate habitat capability is expected from implementation of any alternative (see Essential Fish Habitat conclusions on page 133). Therefore use of most of these subsistence resources by Kake and Petersburg residents (fish and marine invertebrates) is not expected to be affected by any of the action alternatives or cumulatively within the analysis area.

Food Plants

Subsistence plant foods consist of a variety of species. Some of the most sought after types include kelp, seaweed, goose tongue, mushrooms, and berries. Roads and previous timber harvest areas within the project area are excellent berry harvest locations since many berry species thrive on open, exposed slopes (Alaback 1982). None of the alternatives is expected to negatively affect subsistence plants gathered for food. Reasonably foreseeable effects of the action alternatives on the abundance and distribution of food plants would be minimal.

Access to Subsistence Resources

Resource Analysis Area

Access to subsistence resources is analyzed on the project area as this is the area where access will be affected by proposed activities and because the Kake Road System is not connected to another road system or community.

Direct and Indirect Effects

For a detailed analysis of roads reference the Transportation section in this chapter or the resource report in the project record.

The primary modes of access for harvesting wildlife and other subsistence resources include boats, foot travel, motorized vehicles, and all-terrain vehicles. The Central Kupreanof project area is connected to the community of Kake by a road system.

Access by boat and foot would not be restricted by any of the action alternatives. Access to areas along the beach fringe would not change.

All action alternatives would increase open road miles during implementation of the project and for up to ten years after the completion of timber harvest activities; however, all action alternatives would ultimately reduce miles open to motorized vehicle access. While new NFS roads may remain open for an additional five to ten years after the timber sale for such use as regeneration surveys and firewood gathering, long-term management objectives for all new and reconstructed NFS roads are to place them in storage and close them to motorized vehicle use. This increase in motorized vehicle access is considered limited and should not be considered for long-term use. An additional 1.69 miles of existing open NFS road would also be closed after timber harvest activities are completed. This closure would ultimately reduce the road density in all action alternatives by approximately 1 percent, which is considered insignificant. Temporary roads are built by and authorized for use by the timber purchaser for the sole purpose of accessing timber. Temporary roads are not open to the public and therefore are not considered in the increase or decrease of public access.

Alternative 3 proposes to build the most miles of road and has the potential for the most increased access with approximately 25.1 miles of new NFS road and 9.1 of reconstruction. Alternative 2 proposes an increase in access by construction of 7.3 miles of new NFS road and 2.9 miles of reconstruction. Alternative 4 does not increase long-term access within the project area as it does not construct any new NFS roads. However, with 2.6 miles of reconstructed road, areas that have been closed would be opened for a limited time. The increase in roads in all action alternatives would allow users to access some new areas with a motorized vehicle and therefore would increase their access (to different degrees) until roads are closed within ten years of the completion of the timber harvest activities..

Projects Common to all Action Alternatives

Projects Common to all Action Alternatives are planned in the Central Kupreanof project area. Removal of stream crossings and closures of roads would benefit wildlife but may not benefit subsistence users by limiting road densities and motorized human access. Implementation

of this project would be dependent on the analysis and decisions made in the District Access Travel Management process. Vegetation treatments should benefit wildlife and subsistence users as it helps to restore side lighting to the forest floor, increasing the production of Forbes and shrubs as well helping to promote taller and denser stands of trees that can provide shelter (snow interception). Projects involving recreation may not benefit wildlife but benefit subsistence users as the projects may increase access (trails) or encourage people to gather (camp sites, shelters). These projects may not harm wildlife directly but it may encourage people to be in the area who may indirectly take wildlife as part of their experience or opportunity.

Cumulative Effects for Access

Recommendations for additional road closures, use designations, and road decommissioning were developed through the update of the Kake Road System RAP. While these road management objective recommendations have the potential to affect access, they will be carried forward and analyzed during the District Access Travel Management process. Implementation of the road management objectives will be dependent on the decisions made in the ATM EA.

Competition for Subsistence Resources

Competition is closely linked to access. Building new roads opens an area by increasing access. This may be a favorable development for some subsistence users who depend on a road to transport their animals or resources from the field. On the other hand, the increased and potentially easier access could mean increased competition for subsistence resources and may have an adverse impact on current subsistence users. Increased access can also be favorable for subsistence users, creating easier access to hunting and gathering areas but may have a long-term adverse impact for users if over-harvesting occurs.

None of the action alternatives are expected to have any effect on competition between rural and non-rural residents since none of the alternatives change the existing access patterns to other communities. Potential conflicts among user groups for subsistence resources would be the same among alternatives.

ANILCA Compliance

The actions proposed in this document have been examined to determine whether they are in compliance with the Alaska National Interest Lands Conservation Act (ANILCA) Section 810 and 811. Standards used for the review include:

- National Forest Management Act of 1976 and its implementing regulations
- Alaska National Interest Lands Conservation Act (1980)
- Tongass Land and Resource Management Plan (1997)
- Tongass Timber Reform Act (1990)
- Alaska State Forest Practices Act (1993)
- Alaska Coastal Management Program (1997)
- Multiple Use Sustained Yield Act (1960)
- USDA Forest Service Subsistence Management and Uses Handbook (FSH 2690.23)

The actions have been determined to be in compliance with these standards and with ANILCA.

Necessary and Consistent with Sound Management of Public Lands

ANILCA placed an emphasis on the maintenance of subsistence resources and lifestyles. However, the Act also required the Forest Service to make timber available for harvest from the Tongass National Forest. The Forest Plan determines which uses are suitable for various areas of land within the Tongass National Forest. The Forest Plan has determined that the Central Kupreanof Project Area should be managed for varying levels of timber production.

The alternatives presented here encompass three action alternatives that would help achieve multiple-use management objectives in the Forest Plan. None of the action alternatives has a significant possibility of a significant restriction to subsistence uses. For subsistence deer use, a significant possibility of a significant restriction on the current level of subsistence deer harvest due to federal forest management activities is not likely under any of the alternatives.

Amount of Land Necessary to Accomplish the Purpose of the Proposed Action

The amount of public land necessary to implement each of the alternatives is, considering sound multiple use management of public lands, the minimum necessary to accomplish the objectives of the alternatives. One or more rural communities for subsistence purposes use much of the Tongass National Forest. It is not possible to lessen timber harvest in one area, and concentrate it in another without influencing one or more rural communities' important subsistence use areas.

Many of the decisions to minimize the amount of public land that would be used for timber harvest were made as part of the Forest Plan.

The Forest Plan allocated many important subsistence use areas to land use designations that do not allow timber harvest.

The extent and location of the subsistence use areas in the Central Kupreanof project area make it impossible to completely avoid subsistence areas during timber harvest. However, large areas of deer habitat are protected in old-growth habitat reserves, riparian, beach buffers and other non-development LUDs. Fish habitat is protected in each alternative through the application of Forest Plan standards and guidelines. Existing roads and logged areas are currently used for subsistence hunting and food gathering activities. All temporary roads would be decommissioned following harvest. All NFS roads reopened during the harvest activity and new NFS roads would be put into storage within ten years of harvest. Please refer to the Road Management Objective for each road located in the Appendix B and the project record.

Hydrology/Fisheries

Analysis area

Watersheds

Within the project area there are portions of nine watersheds corresponding to the 6th level Hydrologic Unit Code (HUC) recognized by the US Geological Survey (USGS) (Figure 3-3). These include both “true” watersheds in which all surface water drains to a single stream or river, and “frontal” watersheds along coastlines or bays having more than one outlet. Of the nine watersheds, seven are analyzed in detail, with watershed size, occurrence of high and very high hazard soils, natural and management-induced sources of disturbance, stream density, timber harvest history, road density, and percent of basin as roads summarized in tables below. East Keku Strait, a watershed partially in the project area, had a 13-acre area harvested in 1929 and no previous road building. This watershed has no planned timber harvest or road building, and will only be considered in terms of cumulative effects. The southwest corner of Towers Arm Watershed includes 42 acres proposed for harvest in unit 217 of Alternative 3. There has been no previous harvest and no roads in this watershed, and no roads are proposed. The proposed harvest prescription is single tree selection and comprises 0.2 percent of the watershed area. The effects of harvesting this area would be negligible on the watershed scale, and no detrimental hydrological effects are expected if implemented, therefore this watershed will also only be analyzed in terms of cumulative effects.

Central Kupreanof Timber Harvest
Figure 3-3
Stream Class and Watersheds

Legend
- Analyzed Watersheds
- Watershed Boundary
- Lakes
- Stream Class I
- Stream Class II
- Stream Class III
- Stream Class IV
- Existing Open Roads
- Roads in Storage (Closed)
- Project Area Boundary
- Fish Pass

Duncan Canal
West Duncan
Castle
Tunehean
Hamilton
Big John
Keku
McNaughton
Rocky Pass
Irish Creek Fish Pass
Upper Keku Creek Fish Pass
45602
45601
6336
6339
6318
6326
6333
6334
6328
45808
45803
6314S
45806
6327
6040
6326
45001
45002
6314
6339
6336
6090

0 0.5 1 2 3 4 Miles

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Affected Environment and Existing Condition

Watershed Characterization & Field Methods

Watersheds were identified, delineated, and characterized primarily using information queried from the Tongass GIS library. Climate conditions and precipitation values in project-area watersheds were determined using a regional water resource atlas (USDA, Forest Service 1979), with regional patterns confirmed using the Alaska Climate Research Center website (http://climate.gi.alaska.edu/). GIS is used to summarize location, climate, geology, hydrology, stream density, road density, harvest history, landslide inventory, and disturbance regimes including erosion and mass movement hazard. District-wide road condition surveys were used in conjunction with GIS to determine number of stream crossings, and streams requiring additional information or field verification. Field surveys were conducted to verify fish presence or absence, fish species, stream class and channel type, and to map streams in the proposed harvest units and surrounding areas within project area watersheds using Global Positioning System (GPS). Employees are trained to determine stream class using both fish presence and stream channel characteristics. Relative changes in stream gradient, flow, pool quality and frequency, and barriers to upstream movement are used to determine extent of fish habitat upstream of the last fish detection. Fish presence or absence is verified using a backpack electrofisher. Employees also categorize stream channels according to the Tongass National Forest Channel Type User Guide (USDA Forest Service, 1992), the foundation upon which aquatic habitat management prescriptions are developed. Individual channel type classification methods are discussed in more detail in the Aquatics Resource Report (Whitacre and Harlan, 2009). The above information is combined with available water quality and fish distribution data for an overall watershed characterization.

Water Quality

Water quality information on streams within the project area is limited. An historical USGS stream gage on Hamilton Creek recorded temperatures exceeding the Alaska Department of Environmental Conservation's 20 degree C maximum standard in most years of record. Hamilton Creek is a large, low gradient stream of sufficient width that the riparian canopy cannot effectively shade large portions of its length. Occasional water temperatures greater than 20 degrees are therefore assumed to be a normal response to ambient conditions for this stream. Recent data from three case-study watersheds on Prince of Wales Island indicate temperature limits are exceeded even in unmanaged watersheds under conditions of higher than normal air temperature (Thompson and Tucker, 2007).

Harvest History

Timber harvest within project area watersheds began in 1929 on the beach fringe in the West Duncan Canal watershed. Harvest rates were low until the mid-1960s when the Kake road system was built, with harvest of suitable timber in valley bottoms and toe slopes easily accessible from the road system. There are no watersheds within the project area with more than 20 percent of the timber harvested in the past 30 years, a conservative estimate of the time needed for hydrologic recovery. Full hydrologic recovery in the absence of roads is expected to require between 10 and 30 years in the Pacific Northwest (Hicks et al., 1991; Jones, 2000; Moore and Wondzell, 2005). Less than 9 percent of McNaughton Point Watershed has been harvested in the past 30 years, the highest of all project area watersheds (Table 3-23).

Table 3-23. Summary of Timber Harvest Acres in Project Area Watersheds (not including road clearings)

Watershed	Watershed Acres	Total Acres Harvested	Total Percent Harvested	Percent Harvested Since 1978
Hamilton	49,810	2,542	5.1	3.2
McNaughton Pt	10,212	898	8.8	8.8
Big John Creek	12,977	585	4.5	4.5
West Duncan Canal	43,817	844	1.9	0.4
Keku Creek	30,796	57	0.2	0.2
Castle River	33,060	425	1.3	1.3
Tunehean Creek	24,734	390	1.6	1.2

Natural Disturbance Processes

Watersheds in the project area are generally characterized by low relief (steepness) of the mainstem channels, with portions of the watershed having high concavity profiles where steep mountain slopes meet low-gradient valleys. Landslides and debris flows in these settings typically deliver sediment and debris in discrete deposits in the form of large log jams and fans at confluences, resulting in patchy disturbance patterns (May, 2007; Benda et al., 2004). Watershed factors such as drainage

efficiency (as measured by stream density), road density, percent of basin as roads, time elapsed since timber harvest, steepness of the topography, and percent of the watershed with high and very high MMI soils (MMI-3 and MMI-4, see Soils report) contribute to determining risk of mass movement. Mass movement events such as landslides and debris torrents may be accelerated by forest management activity if surface or subsurface hydrologic characteristics of the site are altered, as can occur with timber harvest and road drainage diversions (May, 2007; Swanston and Marion, 1991). A landslide inventory was completed in December 2003, using 1998 aerial photos and the Forest Service land surveys completed in the 1960s and 1980s. Landslide occurrence in project area watersheds is low, reflecting the low percentage of soils within the high and very high MMI categories and generally low relief topography (Table 3-24).

Table 3-24. Percent of High and Very High Hazard MMI Soil Types and Landslide Summary for Project Area Watersheds[1]

Hazard Soils / Landslides	Hamilton Creek	McNaughton Point	Big John Creek	W Duncan Canal	Keku Creek	Castle River	Tunehean Creek
MMI-3	2	2	4	9	4	6	7
MMI-4	1	0.5	6	7	1	5	5
Number of[1] Landslides	3	0	4	1	0	8	6
Landslide Area (acres)	3.0	0	21.2	6.0	0.0	11.4	21.0

[1] Landslide totals include those slides occurring outside the project area but within project-area watersheds.

Windthrow is also a source of natural disturbance in project area watersheds. Aerial photo and field assessments of windthrow in proposed units within project area watersheds indicate natural riparian windthrow is not a significant stream disturbing process, although individual tree windthrow is probably an important source of large woody debris to stream channels. See Timber and Vegetation section for further discussion of windthrow.

Fluvial Process Groups and Stream Density

Watersheds within the project area contain nine of ten process groups defined in the Channel Type User Guide for the Tongass National Forest (USDA Forest Service, 1992). One characteristic that helps define each process group is the predominant sediment transport

regime. Relative proportions of these regimes and their location with respect to proposed management activities within a watershed can aid in assessing the risk of sediment delivery to streams. Stream densities (miles of stream per square mile of area) can be used to indicate how efficiently this sediment may be routed through the watershed. Generally, the higher the stream density the more efficiently it may be routed. Watersheds with high relative stream densities and a greater proportion of streams dominated by deposition regimes may be more susceptible to sediment-related impacts.

Roads and Stream Crossings

There are currently 129 miles of roads in project area watersheds. This estimate includes all roads ever built, NFS and temporary roads, regardless of age. Since maintenance regimes of roads within the project area differ (for example some are decommissioned while others are suitable for passenger vehicles), varying degrees of hydrological effect due to roads can be assumed. Including all road miles in each watershed provides the most conservative analysis possible for determining the effect of roads on watershed hydrology.

Percentage of watershed area occupied by roads, and density of stream crossings have been used to help quantify the risk of flow-related impacts to aquatic systems including sediment introduction into streams. Sediment introduction is influenced by many factors including type of structure at the crossing, road slope, age, road condition, time since last graded, seasonal timing of maintenance activities, hillslope length, soil depth, and cutbank depth (Croke et al., 2005; Wemple and Jones, 2003; Kahklen and Hartsog, 1997; Reid and Dunne, 1984).

The densities of roads, streams, stream-crossings, and percent basin area as roads are low in project area watersheds, with the highest values occurring in the McNaughton Point and Big John Creek watersheds, respectively (3-25). Studies in Southeast Alaska have correlated higher rates of road erosion with heavy traffic and poor quality rock surfacing (Kahklen and Hartsog 1999). In Washington's Olympic Peninsula, accumulation of fine sediment in streambeds was found to be highest in basins where the road area exceeded 2.5 percent of the basin area (Cederholm et al. 1980). A statistical relationship between fine streambed sediment and watershed disturbance has not been reported in Southeast Alaska studies (Bryant et al 2004, Woodsmith et al 2005). Nonetheless, Cederholm's suggested threshold provides a way to evaluate the potential impacts of roaded area in the affected watersheds in comparison to findings elsewhere in the Pacific Northwest.

Table 3-25. Density of Roads and Streams in Project Area Watersheds

Watershed	Area (mi^2)	Road Miles	Road Density (mi/mi^2)	% Basin as Roads	Stream Density (mi/mi^2)	Stream Crossing Density (# crossing $/mi^2$)
Hamilton Creek	77.8	49.7	0.6	0.5	2.1	1.5
McNaughton Point	16	16.8	1.1	0.8	2.6	5.5
Big John Creek	20.3	17.6	0.9	0.7	2.8	6
West Duncan Canal	68.5	19.0	0.3	0.2	2.2	1.2
Keku Creek	48.1	5.5	0.1	0.1	2	0.5
Castle River	51.7	13.9	0.3	0.2	2.1	0.6
Tunehean Creek	38.6	6.5	0.2	0.1	2.2	0.7
Total	**320.9**	**128.9**				

The condition of existing roads, culverts, and drainage features are assessed during road condition surveys (RCS). As part of these surveys, each road crossing structure in a fish stream is assessed for its ability to provide unimpeded passage (USDA Forest Service, 2001). Fish crossings are categorized red, gray, or green according to passage conditions. A red fish crossing has a high certainty of not providing juvenile fish passage at all desired stream flows; a green crossing has a high certainty of meeting juvenile fish passage at all desired stream flows; and a gray crossing requires additional analysis to determine its ability to provide juvenile fish passage.

According to the most current RCS data, there are 54 red crossings, 7 gray crossings, and 47 green crossings within the project area and on the haul route between the project area and the Little Hamilton LTF. A stream crossing is classified as Class I (anadromous) or II (resident) if it has verified anadromous or resident fish downstream and habitat or verified fish presence upstream.

An analysis of the available data was conducted to determine the amount of upstream habitat impacted by red crossings. The number and location of red crossings was queried from the existing RCS data, and field-verified Upstream Habitat Assessment (UA) data corresponding to these locations was used to determine the amount of upstream habitat impacted. GIS and aerial photo interpretation was used for 4 crossings for which UA data was unavailable. Of the 54 culverts, 50 are classified as Class II stream crossings and 4 are classified as Class I stream crossings (Table 3-26).

Table 3-26. Summary of Upstream Habitat Impacted by Red Fish Crossings

		Miles of Habitat Impacted		Total Habitat Available (miles)	
Watershed	**# of Red x-ings**	**Class I**	**Class II**	**Class I**	**Class II**
Hamilton Creek	22	0.6	7.2	111.2	16.3
McNaughton Point	14	0.3	2.3	24.9	4.5
Big John Creek	8	0	1.7	25.6	11.7
West Duncan Canal	3	0	0.5	47.5	47.9
Keku Creek	0	0	0.0	59.1	17.8
Castle River	6	0	1.9	64.9	16.0
Tunehean Creek	0	0	0.0	35.6	24.3
Cathedral Falls[1]	1	0	0.3	1.6	39.4
Total	**54.0**	**0.9**	**13.9**	**370.4**	**177.9**

[1] Miles of stream in Cathedral Falls Watershed included due to red fish crossing along haul route**.**

A total of 14.8 miles, or 2.7% of the total available habitat was determined to be impacted, with 5 of the 54 red crossings accounting for 38% of the total habitat impacted.

While red fish crossings have a high certainty of not providing juvenile fish passage at all desired stream flows, they are not necessarily complete barriers. More often they impede passage to juvenile fish at higher flows, and remain passable at lower flows. A study conducted on Mitkof Island found most cutthroat and Dolly

Varden move within a narrow range of flows with few moving at higher flow volumes (Bryant et al., 2009). All fish in the study moved upstream at flows below bankfull conditions. Our analyses shows 93% of the red fish crossings in the project area had fish present upstream, indicating the culverts are allowing passage at most flows and are not complete barriers. The 4 Class II red crossings with no fish upstream may or may not be impacting passage because stream class determinations are based on habitat characteristics as well as the presence of fish downstream. It is unknown whether fish historically utilized these upstream areas even if downstream presence is verified. For example, the one Class I stream crossing with no anadromous fish verified upstream or downstream was classified using habitat criteria. This crossing has resident fish upstream and downstream of the crossing suggesting the culvert is not impeding passage and anadromous fish may never have used the available Class I habitat. Additionally, the estimate of total habitat impacted is conservative since many Class I and II streams remain unmapped. For example, some of the known red fish crossings are not in the GIS layer and therefore are not included in the GIS query of total habitat available. Also, the UA survey data includes all unmapped tributaries to the red fish crossings which have fish or fish habitat, while those queried through GIS do not. The 548.6 miles of available habitat in project area watersheds, therefore, is likely underestimated and the true percentage of habitat impacted by red fish culverts is much lower. Overall, the total amount of habitat impacted is proportionally low, with 93% of red fish crossings having fish upstream and a conservative 2.7% of total habitat impacted. Many of these crossings may be corrected through the proposed road closures identified through the Road Analysis process (RAP). Red fish culverts associated with these proposed closures will be identified in the Petersburg Access Travel Management Environmental Assessment scheduled in 2009.

Fisheries

Streams on the Tongass National Forest are divided into value classes from I to IV indicating levels of habitat use by fish populations (USDA Forest Service, 2001b). The abundant Class I and Class II habitat in the form of streams and lakes indicates high fisheries value within the project area (Table 3-27).

Table 3-27. Stream Classes and Lake/Pond Habitat within Project Area Watersheds

Stream Class (miles)							
Watershed	**Area (mi^2)**	**I**	**II**	**III**	**IV**	**Lakes & Ponds (acres)**	**# Lakes & Ponds with Fish Habitat**
Hamilton Creek	77.8	111.2	16.3	10.9	26.2	82	18
McNaughton Pt	16	24.9	4.5	2.5	10.1	0	0
Big John Creek	20.3	25.6	11.7	7.1	12.2	98	3
West Duncan Canal	68.5	47.5	47.9	40.3	17.9	313	38
Keku Creek	48.1	59.1	17.8	18.6	1.5	326	30
Castle River	51.7	64.9	16	15.2	10.8	70	7
Tunehean Creek	38.6	35.6	24.3	20.6	4.1	189	12
Total Stream[1] Class	**320.9**	**368.9**	**138.4**	**115.3**	**82.8**		

1 Miles of stream reflects the best information available from aerial photos and field reconnaissance. These numbers do not reflect class 4 streams not visible from aerial photos, or those that are not near proposed harvest units

Alaska Department of Fish and Game maintains a catalog of waters important for the spawning, rearing, or migration of anadromous fish (Johnson et al., 2004). The catalog and field verification provide information about the fish species found within each watershed (Table 3-28). All project area watersheds contain some fish habitat.

Table 3-28. Anadromous Fish Presence in Project Watersheds

Fish species	Hamilton Creek	McNaughton Point	Big John Creek	W Duncan Canal	Keku Creek	Castle River	Tunehean Creek
coho salmon	X	X	X	X	X	X	X
chum salmon	X	X	X	X	X	X	X
pink salmon	X	X	X	X	X		X
sockeye salmon							X
steelhead	X			X	X	X	X
cutthroat	X	X		X		X	X
Dolly Varden	X	X	X	X		X	X

Keku-Irish Creek Fishpasses

Previous fisheries efforts created two fishpasses in the Keku Creek watershed, with resting pools blasted into bedrock at a third site that delayed fish. Irish fishpass is low in the watershed and outside the project area. This fishpass is a 160-foot long vertical slot fish ladder that was built in 1984 to allow coho to bypass a 23-foot waterfall. The area above the fishpass was stocked with coho but the pass is used by steelhead, pink and chum salmon.

Keku fishpass, built in 1985, is a 30-foot long steeppass located higher in the watershed and within the project area to allow coho to bypass an 11-foot waterfall. The fishpass is used by coho and steelhead. Over 3 million coho fry from Crystal Lake Hatchery were released in the upper watershed from 1983 through 1986. A natural bedrock cascade was identified above the Keku fishpass as partially blocking fish migration, and was modified three times to improve fish passage. The two fishpasses provided anadromous access to approximately 45 miles of stream habitat and 170 acres of lake habitat estimated to produce 40,000 pink salmon, 16,000 chums, and 29,000 coho. Approximately 67 acres are proposed for harvest in this watershed, in units containing no recorded fish habitat. Minimal effect to the fisheries resources enhanced by these fishpasses is expected.

Marine Environment

Watersheds within the project area include some shoreline along Duncan Canal and Rocky Pass containing diverse estuarine and tidal habitats, areas vital for some commercially important species such as Dungeness crab and juvenile salmon. These areas are part of a complex and diverse ecosystem that includes shrimp, flatfish, marine worms, starfish, sponges, anemones, sea cucumbers, urchins, shellfish, plankton, marine algae, and other organisms.

Log Transfer Facilities are planned points of concentrated activity along these shoreline environments, with the remaining shoreline protected by a 1,000-foot buffer (Forest Plan, 2008). The Little Hamilton Bay LTF would be used to barge or raft the logs for this project. The Little Hamilton Bay LTF, located on Little Hamilton Island and connected to Kupreanof by a land bridge road, was placed on the Section 303(d) list of impaired waters in 1996 due to bark and woody debris accumulation on the bottom of Hamilton Bay as a result of logging operations. The bay was removed from the list in 2002/2003 after a dive survey in June 2002 found compliance with water quality standards for residues (http://dec.state.ak.us/water/wqsar/waterbody/2008FinalIntegratedReport3-19-08.pdf).

Direct and Indirect Effects Common to all Action Alternatives

Road Construction / Reconstruction

Each of the proposed action alternatives relies on the existing road system. Action Alternatives 2 and 3 would require the construction and/or reconstruction of NFS roads, while Alternative 4 would only require the reconstruction of NFS roads. Constructing roads involves the immediate impact of removing rock and debris, placing prism material, blading, installing culverts or bridges, and removing timber for road clearings. All action alternatives would increase the number of crossings on fish-bearing streams. Risk of sediment delivery to streams is higher at road crossings, reflecting the potential for culverts to become plugged with sediment and debris. Increased sediment delivery to streams during construction activities may affect individual fish by reducing oxygen levels to developing eggs in spawning gravels and/or trapping emerging fry in the gravel. The use of BMPs and seasonal timing restrictions during construction activities will minimize impacts to fish (see the Road Cards in Appendix B).

A direct effect of implementing all action alternatives would be the temporary increase in sediment delivery to streams due to new road building, road reconstruction, bridge construction, and the installation of culverts as discussed earlier. Short-term sediment delivery from these activities is not expected to degrade water quality beyond the standards established to fully maintain the water body’s designated

beneficial uses (USDA Forest Service, 2006). These standards are addressed directly through mitigation measures described in the unit cards and road cards.

All newly constructed and reconstructed NFS roads would be placed in storage within 10 years of harvest activities. Temporary roads would be decommissioned with the timber sale contract. Additionally, 1.7 miles of currently open NFS road will be stored within 10 years of the timber sale (see Transportation section in this chapter).

Storing roads will keep maintenance needs low and decrease the potential for sediment delivery to streams from the failure of drainage structures. Bridges would be installed at all crossings on streams with fish habitat on proposed temporary roads, and would be removed following the completion of harvest activities. Fish passage will be designed into all streams containing fish habitat as defined by stream class (see Road Cards in Appendix B).

Removal of trees within 200 feet of NFS roads for constructing log stringer bridges, expanding existing rock pits, and constructing new rock pits will be addressed by applying BMPs and Forest Plan Standards and Guidelines. A Pit Development Plan will be reviewed prior to construction of new rock pits.

Table 3-29. Number of Class I and II Crossings on Anadromous and Resident Fish Streams

	ALT 1		ALT 2		ALT 3		ALT 4	
Watershed	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**
Hamilton Creek	0	0	0	0	0	0	0	0
McNaughton Point	0	0	2	0	1	0	0	0
Big John Creek	0	0	0	0	0	0	0	0
W Duncan Canal	0	0	2	1	2	3	0	0
Keku Creek	0	0	0	0	0	0	0	0
Castle River	0	0	0	4	1	9	0	4
Tunehean Creek	0	0	0	0	0	0	0	0
Total	**0**	**0**	**4**	**5**	**4**	**12**	**0**	**4**

Hydrologic Function

Additional direct effects may include localized increase in annual water yield, increased peak flows, and altered timing of water delivery in small streams. Timber harvest causes changes in the collection, storage, and delivery of water in watersheds primarily by affecting evapotranspiration, canopy interception, cloud-water interception, and snow accumulation and melt rates. Peak flow increases may be

undetectable on the watershed scale when harvest levels are below 25 percent (Jones and Grant, 1996; Beschta et al., 2000). Recent literature suggests peak flow increases can only be detected in flows with a return period of six years or less, and that effects of forest harvest on extreme flows cannot be detected using current technologies and data record lengths (Grant et al., 2008). Forest harvest effects are maximized in small watersheds, and diminish or remain constant with increasing watershed size. Further, when present, peak flow effects on channels should be confined to a relatively discrete portion of the channel network (Grant et al., 2008).

Long-term effects of timber harvesting and road building on summer low flows are not well studied. Hicks et al. (1991) documented two case studies in which the long-term effects of logging on summer low flows were opposite: an eventual decrease in low flows was detected in one watershed after a period of increase, but an increase in summer low flows persisted in the other. Variable effects on low flows following harvest have been reported in rain-dominated coastal watersheds (Keppeler and Ziemer, 1990; Hicks et al., 1991). A study in Southeast Alaska concluded that timber harvest may result in higher levels of stream flow during dry periods (Bartos, 1989). However, recent analysis of these data suggests the change could be due to climatic cycles, not timber harvest (Neal, 2000).

Potential changes in hydrologic function from this project are not expected to occur on the watershed scale, but may occur in subwatersheds and tributaries connecting mainstem streams in the short term. These potential effects are expected to diminish with time as a result of hydrologic recovery through vegetation regrowth. Qualitative assessments of changes in water yield, peak flow, and timing of water delivery to channels for each alternative are assumed to be site specific and have negligible effects at the watershed scale.

Riparian Management Areas

Protection and maintenance of naturally functioning aquatic ecosystems from ground-disturbing activities associated with timber harvest is provided through application of Riparian Management Areas (RMAs). RMAs are land areas delineated through land management planning or watershed analysis that provide for the management of riparian resources, and typically occur adjacent to surface water bodies such as streams, lakes, and ponds. The Forest Plan Standards and Guidelines require that RMAs be delineated according to stream value classification and channel type process groups, with minimum protection standards defined for harvest activities and activities associated with road building. Riparian Management Areas are delineated for all Class I, II, and III streams within or adjacent to proposed harvest units according to the following guidelines.

All Class I and II streams are protected from harvest activities within a minimum horizontal distance of 100 feet from the bankfull margins. Harvest activities near Class I, II, and III streams require trees be felled away from the stream and that trees yarded across or along stream courses be fully suspended. Additional measures are taken to protect streams based on stream type process group classification (USDA Forest Service, 2008; Forest Plan, Appendix D-1 through D-20). These measures include increased buffer widths of 140 feet or greater along certain types of Class I, II, and III streams. Under these standards, a no-harvest buffer protects all Class III streams, with harvest excluded in all v-notches associated with steep side slopes. Logging debris introduced into Class IV streams must be removed.

Harvest prescriptions including single tree selection and those requiring a percentage of the available timber in a unit be retained may also help diminish the influence of altered peak flows to streams by lowering the intensity of the harvest treatment (Grant et al., 2008). The Unit Cards and maps show the specific locations of the RMAs and provide instructions for specific mitigation measures designed to protect aquatic resources.

Landslides

Clearcut timber harvest and road building cause an increased risk of landslides, debris flows, and debris torrents (Swanston and Marion, 1991; Brardinoni et al., 2002). The increased risk of landslides is considered an indirect effect to streams, because if landslides do occur they may or may not deliver sediment to streams (see “Soils” section this chapter). GIS indicates 6 of 22 landslides within project-area watersheds impacted streams, with 3 occurring in the mountains forming the eastern boundary in the Big John Creek watershed. Most of these landslides are arrayed to the southwest, and have no proposed units nearby. Minimizing the risk of landslides in clearcut harvest units and where roads are constructed is addressed by applying BMPs and Forest Plan Standards and Guidelines. Each of the proposed action alternatives would increase landslide potential to some degree, with relative risk related to the amount of proposed clearcut harvest acres on high or very high hazard soils. Comparisons of this risk are presented under each alternative.

Log Transfer Facility

Logs will be hauled to the Little Hamilton Bay LTF for transportation by barge or raft to the mill in all action alternatives. Barging the logs would have less effect on marine species. Habitat for managed marine species and their prey may be diminished due to bark accumulation resulting from rafting logs at the LTF. Another effect of log rafting is reduced rearing capability for juvenile salmon due to potentially reduced water quality from bark leachates and shading beneath log rafts and equipment floats.

Projects

Other projects associated with the proposed timber sale having direct and indirect effects include silvicultural thinning and pruning treatments (precommercial and wildlife habitat enhancements), Microsales, road and trail maintenance, invasive plant removal, and removal of structures known to limit fish passage on roads proposed for closure through the RAP. The effects upon implementation of these activities are similar to those described previously and below, regarding potential short-term increases in sedimentation and turbidity. Activities associated with these projects are not expected to have long-term negative effects on watershed hydrology or fish populations.

Cumulative Watershed Effects

Analysis Area

Cumulative watershed effects occur both spatially and temporally. The 6th level HUC watersheds, wholly or partially within the proposed project area, provide the spatial boundaries for direct, indirect, and cumulative watershed effects in this analysis. The 6th level HUC scale is recognized by the U.S. Geological Survey and is the commonly accepted scale for determining potential effects of management activities (Regional Interagency Executive Committee, 1995). Temporally, cumulative watershed effects may be influenced by some of the activities summarized above and in the Central Kupreanof Catalog of Events. This analysis emphasizes timber harvest activities in the past 30 years and road building activities regardless of age, due to their potential effect on peak flows and runoff timing, sediment delivery to streams, and fisheries resources.

Past Activities

Management-related and naturally occurring activities influencing watershed fisheries and hydrology were considered. These included activities summarized in the Central Kupreanof Catalog of Events, number and location of known landslides, miles of NFS and temporary roads and their respective stream crossings, crossings currently impeding fish passage (red fish crossings), and the Irish and Keku fish pass project. While there are currently 54 red fish crossings, the Irish and Keku fish pass project provided approximately 45 miles of anadromous access for coho, steelhead, pink, and chum salmon. Cumulative watershed effects on watershed hydrology from previous harvest and road-building activities are diminished as vegetation encroaches in these areas. The majority of timber harvest in Hamilton Creek and McNaughton Point Watersheds occurred primarily in the 1970s and 1980s, with hydrologic effects trending toward inherent levels. Harvest of previously cleared timber units from the Bohemia Timber Sale, as well as approximately 70 acres as part of the Kake Small Sales project are not considered in the cumulative effects

analysis since these are not within the 6th HUC boundaries defining this analysis.

Current Activities & Processes

Current activities influencing cumulative effects include maintenance of existing roads, revegetation on previously closed roads and open roads receiving little traffic, and revegetation in managed stands with previous harvest.

Future Activities

Besides timber harvest and road building activities analyzed in each alternative below, activities occurring in the foreseeable future which could influence cumulative watershed effects include future closure of the newly constructed and reconstructed NFS roads associated with this sale, decommissioning temporary roads following the timber sale, and closure of additional NFS roads located within the project area but not associated with the proposed timber sale. Some roads have been recommended for closure through the RAP, and will be addressed in the Petersburg Access Travel Management Plan NEPA document scheduled in 2009. Newly constructed and reconstructed NFS roads could remain open for up to 10 years following timber sale activities (see Transportation section this chapter). Decommissioning temporary roads and closing some or all NFS roads constructed for the timber sale would result in a net decrease in the amount of roads needing maintenance. Placing or otherwise ensuring roads are in a self-maintaining hydrologic condition (i.e. constructing water bars, designing rolling dips, drivable water bars, oversized crossing structures) would lower the amount of potential groundwater interception by road cuts, decrease the number of miles in the road related stream network by removing those portions associated with ditches, improve natural drainage patterns, reduce the risk of culvert plugging and stream diversion, and lower the risk of road failures at stream crossings. Removal culverts for road closure is known to temporarily increase sediment delivery and turbidity in some streams. Generally, effects decrease with time and distance downstream and mitigation measures can significantly reduce the sediment yield caused by removals (Foltz et al., 2008).

Since NFS road closures are expected to occur within ten years of implementation of the proposed timber harvest, cumulative effects of these closures are time-sensitive. When culverts are removed, hydrologic recovery is immediate at road crossings; when culverts are not removed, there continues to be a risk of the culvert becoming plugged with sediment and debris. This risk decreases by placing water bars for routing water across the road prism in the case of a failure. Sediment delivery from the road surface and ditches continues until sufficient vegetation regrowth has occurred. Road closures are expected to benefit watershed hydrology and fish passage in the long-term. Short-term increases in sediment delivery associated with road building activities are addressed directly through mitigation measures

described in the Road Cards in Appendix B and through implementation of BMPs. These practices are expected to maintain water quality and fish passage within standards established by the State of Alaska.

Other projects discussed under “Direct and Indirect Effects” having cumulative impacts in the foreseeable future include silvicultural thinning and pruning treatments (precommercial and wildlife habitat enhancements), Microsales, road and trail maintenance, invasive plant removal, and removal of red fish crossings proposed for closure through the RAP. The effects upon implementation of these activities are similar to those described previously. Road and trail maintenance activities are expected to benefit watershed hydrology in the long-term by maintaining drainage efficiency through crossing structures, thereby reducing potential sources of stream sedimentation. Activities associated with the above-described projects are not expected to have a long-term negative effect on fish populations or habitat. While there may be incidental death of fish due to these projects, fish populations in the project area are expected to remain viable and maintained at current levels.

Rates of timber harvest on Kupreanof Island have varied among watersheds but were generally higher in the 1980s. Research suggests timber harvest may have caused non-permanent increases in landslide potential and water yield during certain time periods, and that recovery to pre-harvest conditions is ongoing. Cumulatively, there is a general trend toward recovery of slope stability and pre-harvest rates of canopy interception and evapotranspiration in the two watersheds with the highest levels of proposed harvest (Tables 3-30 and 3-31).

Effects by Alternative

Table 3-30. Summary of Proposed Timber Harvest by Alternative

			ALT 1	ALT 2	ALT 3	ALT 4
Watershed	**ADF&G Number**	**Watershed Size (ac)**	**Harvest (ac)**	**Harvest (ac)**	**Harvest (ac)[1]**	**Harvest (ac)**
Hamilton Creek	109-42-10100	49,810	0	1,031	1,078	651
McNaughton Point	105-32-10185	10,212	0	509	587	314
Big John Creek	105-32-10160	12,977	0	303	336	164
W Duncan Canal	106-43-10350	43,817	0	375	913	82
Keku Creek	105-32-10120	30,796	0	72	72	0
Castle River	106-43-10210	33,060	0	62	465	59
Tunehean Creek	105-32-10040	24,734	0	153	153	56
Total			**0**	**2,505**	**3,604**	**1326**

[1] There is an additional 41.8 acres proposed in Alt 3, located in Towers Arm Watershed near the SE corner of Hamilton Watershed in Unit 217. This watershed was not analyzed separately.

None of the project area watersheds have cumulative harvest levels approaching 20 percent in the past 30 years (Table 3-31). Under the action alternatives, proposed harvest levels would cause increases in the 30-year cumulative harvest in all watersheds if implemented in 2009. The greatest increase in cumulative harvest levels would occur in the McNaughton Point watershed, from 8.8 percent to 14.5 percent in Alternative 3. Cumulative watershed effects are described below under each alternative.

Table 3-31. 30-year Cumulative Harvest Percentage by Alternative[1]

Watershed	Watershed Size (Acres)	Existing (2008)	ALT 1[2]	ALT 2	ALT 3	ALT 4
Hamilton Creek	49,810	3.2	1.9	5.3	5.4	4.6
McNaughton Pt	10,212	8.8	2.9	13.8	14.5	11.9
Big John Creek	12,977	4.5	4.5	6.8	7.1	5.8
West Duncan Canal	43,817	0.4	0.4	1.3	2.5	0.6
Keku Creek	30,796	0.2	0.2	0.4	0.4	0.2
Castle River	33,060	1.3	1.3	1.5	2.7	1.5
Tunehean Creek	24,734	1.2	1.2	1.9	1.9	1.5

[1]Assumes a 2009 implementation date, and that all proposed acres are harvested.
[2] Cumulative percentage values under Alternative 1 reflect hydrologic recovery trend by 2009 in these watersheds.

Alternative 1

Direct and Indirect, Effects

In the no action alternative, no commercial timber harvest would occur and no roads would be built. Selection of this alternative would not preclude regular maintenance of existing roads, including erosion control measures and removal or replacement of culverts. The risk of landslides associated with previously-built roads is ongoing and is considered an indirect effect, because if landslides do occur, they may or may not deliver sediment to streams. Sediment delivery to streams from periodic road maintenance is expected to be minor and within water quality standards set by the State of Alaska.

Cumulative Effects

Cumulative effects associated with the no action alternative are limited to the growth of trees in managed stands harvested in the past and the reestablishment of more natural drainage patterns and vegetation on closed roads. Silvicultural thinning and pruning treatments for precommercial and wildlife habitat enhancement purposes may occur, and are not expected to alter hydrologic function on the watershed scale. Under this alternative, no changes in hydrologic function, sediment delivery to streams, or fish passage are expected beyond

those discussed in "Effects Common to all Action Alternatives," and naturally occurring events. Hydrologic function in all watersheds is expected to improve in the long-term under this alternative with the continued regrowth of vegetation and maintenance of roads and stream crossings. Effects of road closures proposed under the District ATM were discussed previously and are expected to benefit watershed hydrology and fish passage in the long-term. The Irish and Keku fish pass project is expected to continue providing habitat to support fish populations in the Project Area above naturally occurring levels.

Alternative 2

Direct and Indirect Effects

Alternative 2 proposes harvesting 2,505 acres (Table 3-30). Harvest systems would include ground-based cable, shovel yarding, and helicopter. Two thousand sixty-three acres are proposed to be clearcut, of which 266 acres are on slopes with a high mass movement index (MMI-3) (Table 3-32). These areas are assumed to have an increased susceptibility to potential landslides (see Soils report).

Table 3-32. Proposed clearcut acreage[1] in Alternative 2 on High (MMI-3) or Very High (MMI-4) Hazard Soils

Watershed	Proposed Clearcut	MMI-3	MMI-4
Hamilton Creek	914	128	0
McNaughton Pt.	442	56	0
Big John Creek	181	5	0
West Duncan	240	62	0
Keku Creek	72	8	0
Castle River	61	7	0
Tunehean Creek	153	0	0
Total	**2,063**	**266**	**0**

[1] Acres in Proposed Clearcut column include clearcut, clearcut with 10 percent, and clearcut with 50 percent reserve prescriptions. There are approximately 30 acres in McNaughton Point Watershed with a 10 percent reserve prescription in MMI-3 soils.

Alternative 2 proposes clearing approximately 112 acres of timber for approximately 14.0 miles of newly constructed, reconstructed, and temporary roads (Table 3-33). Road building would result in an additional 59 stream crossings in project area watersheds, with 41 on

NFS roads and 18 on temporary roads. New NFS road construction would require one Class I crossing. NFS road reconstruction would require the replacement of one Class I crossings and four Class II crossings. Temporary road construction will require one Class I and one Class II crossing. Both crossings on the temporary roads will be log stringer bridges. The above NFS roads may remain open up to 10 years following timber harvest as discussed in the Transportation section of this chapter. An additional 1.7 miles of roads 6327, 45805, and 45807, including removal of four red fish crossings, will be closed within 10 years of timber harvest. All temporary roads will be decommissioned after timber harvest is complete.

Table 3-33. Road Related Changes Proposed in Alternative 2

Watershed	New NFS	Reconstruct	Temporary	New Stream Crossings	Road Density	% Basin as Roads
Hamilton Creek	4.1	0.1	0.7	22	0.7	0.6
McNaughton Point	1.2	0.0	1.4	14	1.2	1.0
Big John Creek	0.0	1.3	0.8	6	1.0	0.8
W Duncan Canal	1.4	1.0	0.4	5	0.3	0.3
Keku Creek	0.1	0.0	0.3	4	0.1	0.1
Castle River	0.1	0.4	0.1	4	0.3	0.2
Tunehean Creek	0.4	0.0	0.2	4	0.2	0.1
Total	**7.3**	**2.9**	**3.9**	**59**		

Cumulative Effects

Harvest of 2,505 acres within the project area would increase cumulative harvest levels from current levels in all watersheds (Table 3-30). The McNaughton Point watershed has the highest current cumulative harvest level at 8.8 percent, and would continue to have the highest cumulative percent harvest with this alternative. Cumulative effects of previous and proposed timber harvest and road-related activities were discussed above. In this alternative, the extent of these effects would be greater than those in Alternative 4 and lesser than Alternative 3 due to the relative amounts of activities proposed. Cumulative effects associated with ongoing activities are the same as those described in Alternative 1.

Alternative 3

Direct and Indirect Effects

Alternative 3 proposes harvesting 3,647 acres via ground-based cable, shovel yarding, and helicopter logging systems (Table 3-30). There are 3,126 acres of proposed clearcut, of which 482 acres are on slopes with a high mass movement index (Table 3-34). These areas are assumed to be more susceptible to potential landslides (see Soils report). Streams in two units proposed under this alternative were not field verified. GIS and aerial photo interpretation was used in conjunction with field data collected by the road engineer and forestry technicians to assess the likelihood of additional streams in these units. The likelihood of additional Class I or II streams is very low due to the position of the Unit 248 on relatively steep slopes (~ 48%) located higher on the hillside, and a low risk of additional Class III streams based on photo interpretation and field notes. Unit 280 in the Castle River watershed has a moderate risk for a Class II stream near the southern boundary due to the proximity to a known Class II stream. There is also a moderate risk for an additional Class III stream in the northeast portion of the unit based on aerial photography, although no streams with significant notches were indicated by the road engineer when traversing the unit. These units will be field verified by a fisheries biologist during layout, with appropriate RMA buffers applied. The direct and indirect effects of harvest activities were discussed under “Effects Common to all Action Alternatives” and would occur to the greatest extent in this alternative due to the highest number of proposed harvest acres and road miles.

Table 3-34. Proposed Clearcut Acreage[1] in Alternative 3 on High (MMI-3) or Very High (MMI-4) Hazard Soils

Watershed	Proposed Clearcut	MMI-3	MMI-4
Hamilton River	984	140	0
McNaughton Point	520	56	0
Big John Creek	299	54	0
W Duncan Canal	664	217	0
Keku Creek	72	8	0
Castle River	434	7	0
Tunehean Creek	153	0	0
Total	**3,126**	**482**	**0**

[1] Acres in Proposed Clearcut column include clearcut, clearcut with 10 percent, and clearcut with 50 percent reserve prescriptions. There are approximately 30 acres in McNaughton Point Watershed with a 10 percent reserve prescription in MMI-3 soils.

Alternative 3 proposes clearing approximately 341 acres of timber for approximately 40.4 miles of newly constructed, reconstructed, and temporary roads (Table 3-35). Road building would result in an additional 139 stream crossings in project area watersheds, with 101 on NFS roads and 34 on temporary roads. Most of these crossings occur on Class III and IV streams. New NFS road construction would require two Class I and five Class II crossings. There are portions of roads 45897 and 45803 proposed under this alternative with incomplete field information regarding stream crossings. Both roads have stream information along segments within proposed units, but stream crossing data has not been verified in those portions between units on 45897. The same is true for segments of road 45803 outside proposed units between the southern boundary of Unit 261 and the northeastern boundary of Unit 265. The most recent GIS stream layer and aerial photo interpretation were used to determine stream class along these segments. There is therefore an increased risk of underestimating the total number of crossings and potential Class I and II fish crossings on these roads. The potential effects of road building activities to fisheries and hydrology were discussed under “Effects Common to all Alternatives”, and these effects could increase should additional streams be found along these segments. These road segments will be field verified by a fisheries biologist during layout

should this alternative be chosen, and the State of Alaska will conduct Title 16 review of all proposed fish crossings prior to implementation.

NFS road reconstruction would require the replacement of one Class I and four Class II crossings. Temporary road construction would require one Class I and three Class II crossings. All the crossings on the temporary roads will be log stringer bridges. Road crossings on Class I and II fish streams are typically more susceptible to impacts caused by sediment, since these streams tend to occur lower in the watershed, and are predominantly characterized as sediment deposition reaches. The effects of increased sediment delivery to the stream on individual fish and the direct hydrological effects of timber harvest and road building were previously described, and would occur to the greatest extent in this alternative due to higher levels of these activities. An indirect effect of this alternative would be the closure of 1.7 miles total of NFS Roads 6327, 45805, and 45807 within 10 years of harvest, including removal of four red fish crossings. All of the new and reconstructed NFS roads will be closed within ten years of timber harvest. All temporary roads will be decommissioned after timber harvest. Effects of road closures were described previously, and are expected to benefit fish passage and hydrologic function in the long-term. This alternative would have the greatest potential for bark accumulation at the Hamilton Bay LTF because it harvests the most volume of timber.

Table 3-35. Road-Related Changes Proposed in Alternative 3

Watershed	New NFS	Reconstruct	Temporary	New Stream Crossings	New Stream Crossings	%Basin as Roads
Hamilton Creek	5.2	0.9	0.7	31	0.7	0.6
McNaughton Point	1.2	0.0	1.8	14	1.2	1.0
Big John Creek	2.5	2.5	1.0	13	1.0	1.0
W Duncan Canal	10.8	2.2	0.9	43	0.5	0.5
Keku Creek	0.1	0.0	0.3	4	0.1	0.1
Castle River	4.9	2.6	1.2	29	0.4	0.4
Tunehean Creek	0.4	1.0	0.2	5	0.2	0.2
Total	**25.1**	**9.1**	**6.1**	**139**		

Cumulative Effects

Harvest of 3,647 acres within the project area would increase cumulative harvest levels in all watersheds (Table 3-30). The cumulative effects of previous and proposed timber harvest and road building are the same as those described in “Effects common to all

action Alternatives" and Alternative 2, but would occur to the greatest extent in this alternative due to higher levels of these activities.

Alternative 4

Direct and Indirect Effects

Alternative 4 proposes harvesting 1,326 acres, all of which would be clearcut using ground-based cable and shovel yarding. One hundred nineteen of these acres are on slopes with a high mass movement index (MMI-3) (Table 3-36).

Table 3-36. Proposed Clearcut Acreage[1] in Alternative 4 on High (MMI-3) or Very High (MMI-4) Hazard Soils

Watershed	Proposed Clearcut	MMI-3	MMI-4
Hamilton	651	73	0
McNaughton Pt.	314	10	0
Big John Creek	164	5	0
W Duncan Canal	82	31	0
Keku Creek	0	0	0
Castle River	59	0	0
Tunehean Creek	56	0	0
Total	**1326**	**119**	**0**

[1] Acres in Proposed Clearcut column include clearcut, clearcut with 10 percent, and clearcut with 50 percent reserve prescriptions. There are no reserve prescriptions in the high and very high hazard soils in this Alternative.

Alternative 4 proposes clearing approximately 35 acres for approximately 4.8 miles of temporary and reconstructed NFS roads (Table 3-37). Road building would result in an additional 8 stream crossings with 6 on reconstructed NFS roads and 2 on temporary roads. There are no new road crossings on Class I streams. Temporary road construction would require one log stringer bridge over a Class II stream, and NFS road reconstruction will require 3 Class II stream crossings. Direct and indirect effects to watershed hydrology and fisheries related to timber harvest and road building were described under "Effects common to all action Alternatives," and would occur to the least extent in this alternative due to the lowest levels of these activities among action alternatives. All of the new and reconstructed NFS roads plus the 1.7 miles total on NFS Roads 6327, 45805, and

45807 including four red fish crossings, would be closed within ten years of timber harvest. All temporary roads will be decommissioned after timber harvest is complete. Effects of road closures were described previously. This alternative would have the least potential for bark accumulation at the Little Hamilton Bay LTF if the logs are rafted because it harvests the least volume of timber.

Table 3-37. Road-Related Changes Proposed in Alternative 4

Watershed	New NFS	Reconstruct	Temporary	New Stream Crossings	Road Density	% Basin as Roads
Hamilton Creek	0.0	0.9	0.4	2	0.7	0.5
McNaughton Point	0.0	0.0	1.0	1	1.1	0.8
Big John Creek	0.0	1.3	0.5	1	1.0	0.8
W Duncan Canal	0.0	0.0	0.2	0	0.3	0.2
Keku Creek	0.0	0.0	0.0	0	0.1	0.1
Castle River	0.0	0.4	0.1	4	0.3	0.2
Tunehean Creek	0.0	0.0	0.0	0	0.2	0.1
Total	**0.0**	**2.6**	**2.2**	**8**		

Cumulative Effects

Cumulative harvest levels would increase in all but Keku Creek Watershed if this alternative were implemented by 2009 (Table 3-30). Cumulative effects of timber harvest and road building, as well as those activities occurring in the foreseeable future were described previously and are expected to be the same for this alternative, but to the least extent of all action alternatives due to the lowest proposed levels of these activities.

Essential Fish Habitat Assessment

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act require the Forest Service to consult with the National Marine Fisheries Service (NMFS) regarding actions that "may adversely affect" essential fish habitat (EFH) for federally managed marine and anadromous fish species. EFH consultation has been combined with the Forest Service NEPA process. Consultation procedures have been documented in an attachment to the June 26, 2007 NMFS letter to the Regional Forester.

Federally managed fish species are those species under the jurisdiction of the North Pacific Management Council, managed by the NMFS, and included in a fishery management plan (FMP). These common managed species include: Chinook, chum, pink, and sockeye salmon: Walleye pollock; Pacific cod; arrowtooth flounder; yellowfin, rock, rex, dover, and flathead sole; Alaska plaice; sablefish, Pacific Ocean perch; shortraker, rougheye, northern, thornyhead, yelloweye, and dusky rockfish; sculpin; skates; squid; octopus; forage fish; and weathervane scallop. Several common species not managed under FMP include halibut, ling cod, Pacific herring, Dungeness crab, cutthroat trout, steelhead, and Dolly Varden char.

EFH is defined as "those waters and substrates necessary for fish spawning, breeding, feeding, or growth to maturity." Marine EFH in Alaska includes estuarine and marine areas from tidally submerged habitat to the 200-mile exclusive economic zone (EEZ). Freshwater EFH includes streams, rivers, lakes, ponds, wetlands and other bodies of water currently and historically accessible to salmon. EFH for Pacific salmon recognizes six critical life history stages: (1) spawning and incubation of eggs, (2) juvenile rearing, (3) winter and summer rearing during freshwater residency, (4) juvenile migration between freshwater and estuarine rearing habitats, (5) marine residency of immature and maturing adults, and (6) adult spawning migration. Habitat requirements within these periods can differ significantly and any modification of the habitat within these periods can adversely affect EFH.

The four main steps in the consultation process are the following:

- The Forest Service determines if the proposed action will have "no adverse effect" or if it "may adversely affect" EFH. Only the "may adversely affect" determination triggers consultation.
- An EFH Assessment is prepared by the Forest Service as a component of the NEPA and forwarded to the NMFS to initiate formal consultation.

- The NMFS will respond in writing as to whether it concurs with the conclusion in the EFH Assessment and may provide conservation recommendations to further minimize effects of the action on EFH.
- The Forest Service must provide a written response to NMFS within 30 days explaining its evaluation of the conservation recommendations. The response may include reasons for not following the recommendation.

The formal consultation begins when NMFS receives a copy of the draft environmental impact statement (DEIS) with the EFH Assessment.

This EFH Assessment satisfies the requirements by providing 1) a description of the proposed action; 2) an analysis of the potential adverse effects of the action on EFH and the managed species; 3) the Forest Service's conclusions regarding the effects of the action on EFH; and 4) a discussion of proposed mitigation, if applicable.

Potential Adverse Effects on Freshwater EFH

There are approximately 369 miles of Class I streams in the 7 watersheds discussed above in the Hydrology and Fisheries section. Within the project area there are populations of federally managed species of pink, chum, coho, and sockeye salmon as well as populations of Dolly Varden, cutthroat trout, and steelhead.

Potential effects on freshwater EFH include changes in water yield, peak flow volume and timing of flow delivery, sediment delivery, and fish passage at road crossings. A complete discussion of potential adverse effects, including cumulative effects, of the proposed action is in the Hydrology and Fisheries section.

Alternatives 2 and 3 require new Class I road crossings on new NFS, reconstructed NFS, and temporary roads.

Potential adverse effects to freshwater EFH will be minimized due to the following:

- All Class I and II streams within the project area will be protected by a no-harvest buffer of 100 feet or more (see Unit Cards in Appendix B of the DEIS for site-specific activities).
- All Class III streams will be protected by no-harvest buffers according to the Forest Plan. This minimizes the potential impact to downstream Essential Fish Habitat (see Unit Cards in Appendix B of the DEIS for site-specific activities).

- All proposed Class I and Class II road crossings on temporary roads will be log stringer bridges. Temporary roads will be decommissioned after timber harvest is complete.
- BMPs will be implemented to protect water quality and aquatic habitat for all freshwater streams within the project area.
- The Forest Plan has specific Standards and Guidelines for riparian resources (pp 4-50 – 4-54), and riparian buffer criteria (Appendix D) (USDA Forest Service, 2008).

Potential Adverse Effects on Marine EFH

All alternatives use the Little Hamilton Bay LTF. The LTF is located on Little Hamilton Island and is connected to Kupreanof by a land bridge road. Hamilton Bay was placed on the Section 303(d) list of impaired water bodies in 1996 for bark accumulation. This water body was removed from the impaired list in 2002 when the dive survey reports showed that the bark accumulation was 0.6 acres.

Barging the logs would minimize the effect on marine species. One potential effect of rafting logs at the LTF on marine species may be diminished habitat for managed species and their prey due to bark accumulation. Another effect of log rafting is reduced rearing capability for juvenile salmon due to potentially reduced water quality from bark leachates and shading beneath log rafts and equipment floats.

According to the North Pacific Fisheries Management Council database (http://www.fakr.noaa.gov), NMFS has identified Hamilton Bay as EFH for arrowtooth flounder, Atka mackerel, capelin, Dover sole, eulachon, flathead sole, rex sole, rock sole, sand lance, Greenland turbot, octopus, yelloweye rockfish, dusky rockfish, Pacific Ocean perch, walleye pollock, sculpin, skates, shark, squid, weathervane scallop, yellowfin sole, Pacific cod, Sablefish, shortraker and rougheye rockfish, Chinook, chum, coho, sockeye, and pink salmon.

By following the Standards and Guidelines in the Forest Plan and implementing the Best Management Practices (BMPs), the effects on EFH will be minimized due to the following:

All activities at the Little Hamilton LTF will abide by State and Federal permit stipulations.

Conclusions

The Forest Service believes that the Central Kupreanof Timber Sale may adversely affect EFH. However, by following the Standards and Guidelines in the Forest Plan and implementing the Best Management Practices (BMPs), the effects on EFH will be minimized. Impacts to

EFH are likely to occur only from unforeseen events. A copy of the DEIS was given to NMFS as stated in the agreement.

NMFS concurred with the EFH findings and made conservation recommendations. The Forest Service responded to their comments and consultation was completed. See Appendix D for the letter from the NMFS and the Forest Service's response.

Unavoidable Adverse Impacts

Unavoidable adverse impacts associated with this project include short-term increases in sediment delivery to streams from road construction and maintenance activities.

Irreversible and Irretrievable Commitments of Resources

This project does not propose any irreversible or irretrievable commitments of watershed resources.

Timber and Vegetation

Resource Analysis Area

The analysis area covered by this report is the Central Kupreanof Project Area (VCUs 4260, 4271, 4290, 4360, and 4380) and land immediately adjacent to the VCUs. Silviculture responds to land management activities within the project boundary and is sometimes affected by land management activities immediately adjacent to the project area.

Affected Environment

Methods

Initial project area information was obtained from the Petersburg District's Geographic Information System (GIS) library, aerial photos, and the Forest Service Activities Tracking System (FACTS).

During the 2006 and 2007 field seasons, the Petersburg Ranger District's Integrated Resource Inventory (IRI) Crew performed an inventory of the Central Kupreanof Project Area. Information collected contributed to the development of site specific Silvicultural Diagnosis, Logging Systems and Transportation Analysis by timber stand for the area. This analysis included stream surveys, wildlife information and identification of soils that have a high potential for mass wasting. Copies of this information are located within the project record.

Forest Land Classification

The Central Kupreanof Project Area is a mosaic of coniferous forests interspersed with muskeg, scrubland, and alpine plant communities. The forests are primarily western hemlock with a Sitka spruce component, scattered Alaska yellow-cedar and western red cedar. Higher percentages of Sitka spruce are found along streams and other well-drained sites. The understory shrubs are primarily blueberry, huckleberry, and rusty menziesia. Many species of vascular plants, lichens, and mosses occur throughout all habitat types. Forested muskeg with a high percentage of yellow-cedar occurs throughout the project area especially in the lower elevations. Alder is found on disturbed sites such as roadsides, managed stands and along stream banks. Muskegs support shore (lodgepole) pine.

National Forest System lands are defined by vegetative cover, soil type and administratively designated land use. This classification scheme is intended to show the amount of land that is covered by forested vegetation with further divisions to show the amount of that land that is capable of timber production (Table 3-38).

Forested Land comprises about 94% of the National Forest Land in the Central Kupreanof Project Area. Forested land has at least ten percent of the area occupied by forest trees of any size or formerly having had such a tree cover and not developed for non-forest use.

Non-Forest Land comprises about 6% of the National Forest Land in the Central Kupreanof Project Area. Non-forested land has fewer than ten percent of the area occupied by forest trees of any size, or formerly had such a tree cover and is now developed for non-forest use.

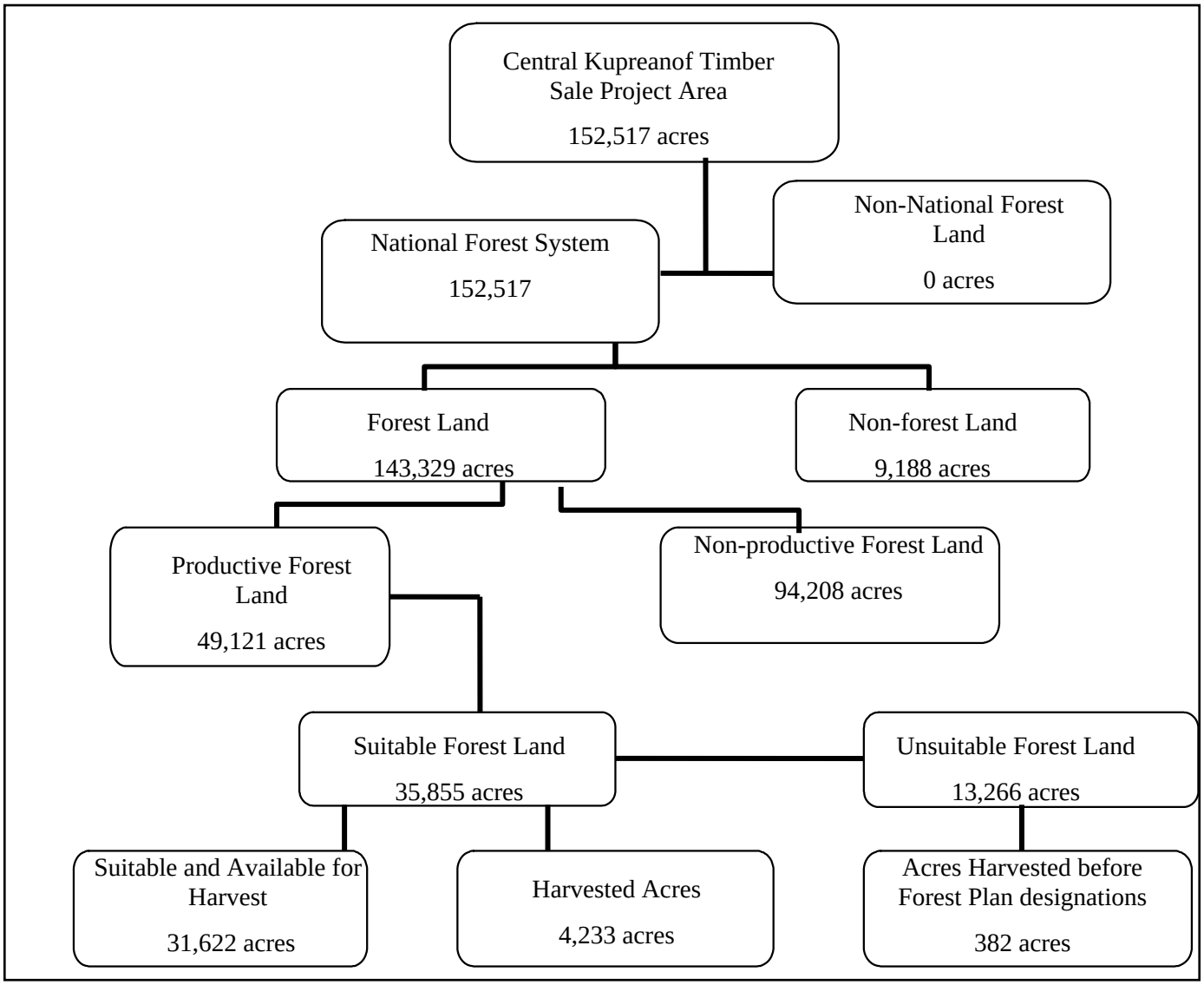
Productive Forest Land comprises about 32% of the National Forest Land in the Central Kupreanof Project Area. Productive forest lands have timber volumes of greater than or equal to 8,000 board feet/acre or have the potential to achieve this volume and are capable of maintaining that volume. This land is capable of producing 20 cubic feet/acre/year of industrial wood per year or having a site index of 40. Productive Forest Land does not necessarily mean that the stand is within the timber base that is available for commercial timber harvest.

Non-Productive Forest Land comprises about 68% of the National Forest Land in the Central Kupreanof Project Area. Non-productive forest land is forested land that does not support enough timber volume to meet the criteria for productive forest land.

Suitable Forest Land is 73% of the productive forest land in the project area that is physically suitable for timber harvest, can be adequately restocked in five years, not withdrawn from timber production, and has been identified in the 2008 Forest Plan (USDA Forest Service 2008) as within a Land Use Designation that has timber available for timber management.

Unsuitable Forest Land includes areas within riparian, beach and estuary buffers, land on slopes greater than 72% that have unstable soils (harvest is allowed on slopes exceeding 72%, but requires an on-site slope stability analysis to determine suitability), and other lands withdrawn from timber production by the 2008 Forest Plan (USDA Forest Service 2008). Approximately 27% of the unsuitable forest land is in the productive forest land base.

Table 3-38. Land Classification Acres (National Forest Land) Within the Project Area



Forest Health and Natural Disturbance

Wind Disturbance

Wind is the major natural disturbance agent affecting forest dynamics in Southeast Alaska. It recycles forest stands and maintains and renews the forest ecosystem. However, timber harvest has the potential to exacerbate the rate of windthrow in adjacent forest stands. The severity and frequency of wind disturbance is determined by many interrelated factors. These influencing factors include tree size and vitality, slope aspect, soil characteristics stand composition, canopy structure and the characteristics of the surrounding topography which may influence wind flow (Harris 1989).

Riparian buffers have been monitored on the Tongass for the past seven years. "The 2006 Tongass Monitoring and Evaluation Report" (USDA Forest Service 2007), states that post harvest windthrow within 183 monitored stream buffers is highly variable and ranges from 0 to 73 percent. Post harvest windthrow is present in 25 percent of the buffers and the average and median cumulative amount of windthrow within these buffers is 12 percent and 6 percent respectively.

Survey crews examined leave trees and unit edges of previous harvest units and stands within the proposed harvest units for windthrow and found only scattered trees. There were no large sections of windthrow found in the project area. The risk of significant wind disturbance as a result of timber harvest in the project area was determined to be low due to the insignificant amount of pre-existing windthrow and an analysis of contributing risk factors. Additional wind protection measures are not planned for any of the proposed harvest units.

Alaska yellow-cedar Decline

Alaska yellow-cedar decline is a disease causing considerable mortality in Southeast Alaska. Mortality can be in small patches or can cover expansive areas. Affected trees may die more quickly (2 or 3 years), or more slowly over a 15-year period or longer with crowns progressively thinning. The cause of yellow-cedar decline is not completely understood but the disease generally occurs on wet poorly drained sites at lower and middle elevations. Recent studies theorize that mortality could be caused by freeze damage to fine roots (Hennon and Shaw). There is approximately 84,000 acres of mapped yellow-cedar decline on Kupreanof Island and the majority of it occurs at elevations below 1,000 feet (Forest Health Protection Report 2008).

All alternatives are consistent with current Forest Plan Standards and Guidelines for their respective Land Use Designations. Currently there is no direction to modify harvest activities based on Alaska yellow-cedar decline which is naturally occurring on approximately

22,000 acres (Forest Health Protection Report 2008) of the project area.

Table 3-4 of the FEIS displays the amount of timber volume harvested by species by alternative. Details are available for individual units and are currently stored in the Natural Resource Information System and are available upon request.

Cedar Composition

On the Tongass National Forest, Alaska yellow-cedar and Western redcedar are found in mixed conifer stands, usually as a component of the more shade tolerant western hemlock type. The cedars are more typically found in the lower volume class strata since they cannot compete with Western hemlock on higher sites. By volume, Alaska yellow-cedar represents about 10 percent of the growing stock volume and is found throughout Southeast Alaska. Western redcedar represents about 6 percent of the growing stock volume and is limited to the southern half of the Tongass National Forest.

The Central Kupreanof Timber Harvest project area encompasses 152,517 acres and of these acres 143,329 acres are forested. Of the forested acres 4,233 are in existing young growth and the project area has been determined to contain 31,622 acres that are currently suitable and available for timber harvest. Alaska yellow-cedar and Western redcedar occurs in the areas suitable and available for timber harvest and also occurs on both unsuitable and non-productive forested lands, lands where large commercial timber sales cannot be planned. Alaska yellow-cedar regeneration is being found in newly regenerated units within the project area (regeneration stand exam records are on file at the Petersburg District Office) and is favored during precommercial thinning operations.

Minor amounts of Western redcedar are scattered across the project area and some incidental trees will be harvested along with the rest of the stand. Some of the previously harvested units in the area have Western redcedar in the regeneration and it is favored during precommercial thinning operations. The North Hamilton River Redcedar Area that is approximately 80 acres in size is within the project area boundary in the northwestern section and is not part of the volume being considered for harvest. This area is identified as being unique because of the high proportion of redcedar it contains and the young growth stand adjacent to this area also has a high proportion of redcedar.

Dwarf Mistletoe

Dwarf mistletoe reduces the vigor and growth rate of hemlock and often produces a low quality of timber. Cankerous swellings often occur at the point of infection on limbs and main stems. These cankers offer an entrance for wood-destroying fungi, which can lead to heart rot.

Dwarf mistletoe progresses relatively slowly in Southeast Alaska; however, with stands which are partially harvested, there may be some infected trees. Clearcut harvesting is an effective method of controlling hemlock dwarf mistletoe if reduction or eradication of the disease is consistent with management objectives (USDA Forest Service, 2001). Dwarf mistletoe infestation is found in low levels throughout the Central Kupreanof project area.

Decay Fungi

Wood decay fungi play an important role in the structure and function of coastal old-growth forests where fire and wind disturbance are uncommon. In addition to creating canopy gaps and wildlife habitat, decay fungi play an important role in nutrient cycling. The importance of wood decay fungi in young managed stands is less well understood.

There is evidence of decay fungi existing at an endemic level throughout the project area. Approximately one third of the old-growth timber volume is defective in Southeast Alaska old-growth stands (Forest Health Protection Report 2008). Although decay develops slowly, the longevity of individual trees allows ample time for significant amount of decay to develop.

Reference Condition

Prior to 1954 no large scale timber harvest had occurred in the project area.

Existing Condition

Past Timber Harvest

The first timber harvest occurred within the Central Kupreanof Timber Harvest Project Area in 1967 on a beach unit on the west side of Duncan Canal. Large-scale industrial logging began in the project area in the 1970s and introduced the area to road construction. During the 1970s until the early 1980s timber harvest in the project area was used to supply the long-term contract held by Alaska Pulp Corporation. From the early 1980s until the present, timber in the project area has been sold as independent timber sales.

Table 3-39. Acres of Suitable and Non-suitable Timber Harvested in the Central Kupreanof Timber Harvest Project Area by Decade

Harvest Period	Suitable Acres Harvested	Non-suitable Acres Harvested
1960-1969	0	54
1970-1979	620	40
1980-1989	1,781	83
1990-1999	861	153
2000-present	971	55
TOTAL	**4,233**	**382**

Note: The numbers in Table 3-39 are from the Petersburg GIS library and differ from the catalog of past NEPA events by 11 acres due to rounding.

Volume Strata

A volume strata was used for estimating the timber volumes and providing correlations for determining vegetation structure on the Central Kupreanof Project Area. This volume strata combines the existing timber inventory with additional information on soils and slope to group the strata. These volume strata are grouped as follows:

- High Volume Stratum. Areas within mapped timber inventory volume classes 5, 6, and 7 on non-hydric soils, and on hydric soils with slopes greater than 55 percent.
- Medium Volume Stratum. Areas within mapped timber inventory volume classes 5, 6, and 7 on hydric soils with slopes less than or equal to 55 percent and areas within mapped timber inventory volume class 4 that are either on non-hydric soils, or are on hydric soils with slopes greater than 55 percent.
- Low Volume Stratum. Areas within mapped timber inventory volume class 4 on hydric soils with slopes less than or equal to 55 percent.

Table 3-40. Volume Strata on Suitable Forest Acres in the Central Kupreanof Project Area

Strata	Suitable Forest Acres
Low	4,762
Medium	14,308
High	16,354
Non Volume Strata	431
Total	**35,855**

Silvicultural Systems

Silvicultural systems are used to manage, harvest, and re-establish stands of forest trees for the purpose of meeting defined objectives. Silvicultural prescriptions have been developed to produce more valuable commercial timber at a faster rate, maintain wildlife habitat, and either maintain or enhance scenery values. No single silvicultural system for a forest stand can be used to achieve all the desired combinations of amenities and products. Instead a variety of treatments applied over the Central Kupreanof Timber Harvest project area results in a mosaic of stands of different structures. By harvest of timber or other treatments such as thinning or pruning, the existing stands would be altered by proposed management actions.

The 2008 Forest Plan (Timber Standards and Guidelines) and USDA Forest Service Manual 2400 (Timber Management) provides detailed information about the silvicultural systems recommended for the Tongass National Forest. Two-aged management will result in a seedling stand with varying levels of older-aged residual trees. Uneven-aged management will result in a stand with younger trees interspersed with older trees, either in clumps or distributed across the stand. Even-aged management will result in the conversion of mature stands to faster growing stands of a single age. The post-harvest conditions of the forest stand for all systems will be dependent upon the existing plant community, the retained canopy structure, and advanced regeneration. Species composition will be monitored to ensure that the mix of species is roughly the same as on the existing site.

The Central Kupreanof Timber Harvest project area analysis used a variety of silvicultural systems tailored to site-specific objectives. The objectives include:

- retaining stand structure to maintain biodiversity
- economics and logging feasibility
- protection of the soil, watershed, wildlife habitat, and scenery characteristics of the project area
- production of wood-fiber for future human use

A complete silvicultural prescription for the entire length of the rotation will be written for each stand selected for harvest. These prescriptions provide guidance for treatments following the proposed timber harvest for this project, including subsequent entries, thinning, and pruning. Table 3-41 shows acres by silviculture system and regeneration method for each alternative.

Even-aged System

All or the majority of the merchantable trees will be harvested leaving 10 percent or less of the original stand's basal area. The objectives of this system are to create a fast-growing stand of trees to maximize wood fiber production, improve timber sale harvest economics and logging feasibility. These stands would regenerate into a mostly single-aged stand. Where this treatment is recommended, it has been determined that it is optimal for the site and the created openings would not exceed 100 acres. The regeneration method chosen to achieve the goals of this system is clearcutting.

Clearcutting- The cutting of all or the majority of the trees leaving 10 percent or less of the original stand's basal area in one harvest entry, producing a fully exposed microsite for the development of a new age class.

Reason for clearcutting – The Forest Plan (p. 4-71) directs the use of clearcutting where such a practice is determined to be the best system to meet the objectives and requirements of the Land Use Designation (LUD). Even-aged management, clearcutting, in the Timber Production LUD is a way to increase commercial timber productivity of the site. Forest Service Manual (FSM) 2470-R-10-2400-2005-1 further clarifies limitations on clearcutting and states it may be used to minimize the occurrence of diseases (dwarf mistletoe), windthrow, logging damage, and to provide for the establishment and growth of desired trees. Even-aged management has not been prescribed where it conflicts with other resources.

Two-aged System

This system is designed to maintain and regenerate a stand with two-age classes. The resulting stand may be two-aged or tend towards the uneven-aged condition as a consequence of both an extended period of regeneration establishment and the retention of reserve trees that may represent one or more age classes. This remaining structure provides wildlife habitat and reduces visual impacts. These stands will not be reentered until the next rotation in approximately 100 years. The regeneration method chosen to achieve the goals of this system is clearcutting with reserves.

Clearcutting with reserves – Stands proposed for this system would have a minimum of 50 percent of the basal area of the stand remaining after harvest. Merchantable trees (trees greater than 9 inches in diameter) would be harvested in patches or individually. This will create a stand of two or more distinct age (size) classes.

Reasons for clearcutting with reserves – This system will provide foraging areas interspersed with cover. The large trees provide habitat for cavity nesters. The appearance of the residual stand mimics natural blowdown patches and single trees. Damage to leave trees and lower commercial stand productivity are acceptable resource tradeoffs to achieve these goals.

Uneven-aged System

This system regenerates and maintains a multi-aged structure by removing some trees in all size classes either singly, in small groups, or in strips. The objective of uneven-aged management is to maintain a stand with trees of three or more distinct age (size) classes, either intimately mixed or in small groups. This remaining structure provides wildlife habitat and reduces visual impacts. The next entry into these stands will be in approximately 75 years when 30 percent of the stands basal area will be removed in patches or in single trees. The regeneration method chosen to achieve the goals of this system is single tree selection.

Single tree selection – Stands proposed for this system would have a minimum of 60 percent of the basal area of the trees remaining after harvest. This will regenerate and maintain a multi-aged structure by removing some trees in various size classes distributed across the stand. Trees to be harvested would be selected by species and diameter limit. A range of diameters generally between 16” and 36” DBH (diameter at breast height) is used to define the trees selected for harvest. Exact harvest diameter limits are based on a timber cruise preformed prior to the actual sale of the harvest units. The resulting stand may have small openings plus individual trees harvested throughout the stand. This will maintain or create a stand of three or

more distinct size classes distributed throughout the stand, resulting in an uneven-aged stand.

Reasons for single tree selection – Removing trees throughout the stand would retain a continuous large tree canopy following harvest. The residual stand would have structural diversity that would provide wildlife habitat and maintain scenic quality. When these stands are harvested with conventional cable logging systems damage to the residual trees and lower commercial stand productivity are acceptable resource tradeoffs to achieve these goals.

Table 3-41. Acres of Silviculture System and Regeneration Method Chosen for the Central Kupreanof Units by Alternative

Regeneration System	Basal Area Retention	Alt. 2	Alt. 3	Alt. 4
Even-aged Management Silviculture System				
Clearcut	None	1,915	3,011	1,288
	10%	116	116	39
Total Acres of Even-aged Management		**2,031**	**3,127**	**1,327**
Two-aged Management Silviculture System				
Clearcut with Reserves	50%	33	0	0
Total Acres of Two-aged Management		**33**	**0**	**0**
Uneven-aged Management Silviculture System				
Single-tree Selection	60%	442	520	0
Total Acres of Uneven-aged Management		**442**	**520**	**0**
Total Acres of Harvest by all Silviculture Systems				
Total Acres of Harvest by Alternative		**2,506**	**3,647**	**1,327**

Intermediate Treatments

Following timber harvest, the managed forest goes through distinctive developmental stages. Removal of the forest overstory alters the microsite conditions that influence density and species composition of the understory vegetation. Natural regeneration is used to restock the harvest units; areas must be reforested with a minimum of 300 trees per acre by the fifth year following harvest. This is monitored with regeneration surveys and certification of successful reforestation. Different components dominate the stand at different stages, and the overall forest structure will change as the new stand develops. The level of change will depend on the type of silvicultural treatment applied during harvest and subsequent treatments applied during stand development. Characteristics such as tree height, diameter, and overall stand productivity will vary according to site class. However, young-growth stands commonly show less variability in tree diameter and height than the old-growth stands they are replacing. Young-growth timber has a stand size ranging from seed-saplings, pole-timber, up to saw-timber. It is usually the result of clearcut harvest. Currently, about 13 percent of the suitable forestland in the Central Kupreanof Project Area is young-growth timber. Management of these harvested acres will improve stand conditions for future timber production and increase forage for deer and moose. Young-growth stands are candidates for thinning and pruning.

Thinning

Following timber harvest, natural regeneration often results in stands with too many trees per acre, reducing individual tree growth and shading out understory vegetation that may be valuable to some wildlife species. Thinning is designed to improve future tree growth by reducing stand density, thus reducing the competition between trees for sunlight. Increased sunlight as a result of thinning also allows for greater shrub and forb growth, thereby increasing wildlife forage.

In older harvested stands (35 to 45 years or older), as the canopy progressively closes and sunlight is virtually absent, the understory vegetation becomes suppressed. In general if stands are not thinned by the age of 40 years, the thinning slash is extremely thick due to the size of the cut trees (some as large as 6 inches in diameter and 30 feet in height). The slash does not come into contact with the ground, and decomposes slowly. Consequently, sunlight would still be limited due to the accumulation of thinning slash, and germination of forage species would be limited for an extended period of time.

Conversely, it is too early to thin when canopy cover is relatively sparse with many open spaces between trees. At this stage, there is probably abundant forage, and thinning would probably not provide much more forage. In addition, new hemlock regeneration could

become established after the thinning and suppress some release of the forage. When thinned too early, trees have not expressed dominance, making it difficult to select which trees to cut while thinning.

The first thinning program for harvested stands in the Central Kupreanof Project Area began in 1987, when stands were approximately 10 to 15 years old. Currently stand thinning is prescribed at 25 – 30 years of age. Since 1986, stands have been periodically surveyed to determine the need for thinning. Approximately 1,110 acres of the 4,616 acres (this includes historical harvest that took place on land not classified as suitable) that have been harvested on all lands in the Central Kupreanof Project Area have been thinned to date. The remaining unthinned acres are not eligible for thinning at this time because the stands are either too young for thinning to be effective or between tree competition has not yet developed enough to warrant thinning, due to site conditions.

It is not known if thinning will have an application in uneven-aged stands resulting from partial harvest. Stocking surveys and additional analysis will be done as these stands develop.

Pruning

As a harvested stand develops to the point where the trees are too large to thin and the understory is stressed but able to be released, pruning may be considered. It may provide enough indirect sunlight penetration through the canopy to maintain the understory vegetation for wildlife forage. Pruning also increases the value of each tree, by providing knot-free wood as the tree grows. Pruning will allow the maximum volume to be produced in the stand while still maintaining the vegetative understory.

Effects of Alternatives and Environmental Consequences

The structure of the forest will be affected by timber harvest. The effects will vary by the silvicultural prescription and the number of acres harvested. Removal of trees in patches will result in small openings that will regenerate to second-growth forest. Removal of trees dispersed throughout the stand will result in older trees interspersed with the regeneration of young trees. Clearcut harvest will result in the creation of primarily second-growth stands with or without older residual trees. Forest health concerns, including the removal of trees with disease or that face imminent mortality, can be used as factors determining which trees to harvest. The removal of trees that are dead or in poor health from the effects of Alaska yellow-cedar decline, dwarf mistletoe or other diseases can improve the health and vigor of stands. Some minor windthrow will likely occur in and around harvested stands.

Current levels of timber harvest on the Tongass are not expected to have an adverse affect on the quantity or composition of cedar (or any species) in the future. Where single tree selection or two-aged management is applied, the amount of residual cedar left is proportional to the amount prior to harvest. Since both cedars are shade intolerant, removal of a portion of the overstory could release cedar if advanced regeneration is present. Silvicultural treatments in young growth stands, such as precommercial thinning, pruning, and commercial thinning, favor the release of cedars to maintain cedar species composition and because they are valuable crop trees for future harvest.

Projects Common to all Action Alternatives

Currently there are approximately 325 acres of precommercial thinning to accomplish in young growth stands that could potentially be done under a stewardship contract on the Kake road system. These stands are approximately 25 years old and an individual prescription will be written for each stand to identify species and spacing of the leave trees to improve future tree growth and increase sunlight to the forest floor and in turn increasing wildlife forage production. Other proposed projects should have no effect on the vegetation resource on the suitable forest acres within the project area.

The implementation of a Microsale program would have no significant effect on Silviculture.

Alternative 1

Vegetation and forest health would not be affected by management activities. Tree growth and mortality would continue to progress naturally. Other forestlands with land use designations that allow timber harvest would be needed to meet the objective of providing timber for public consumption to meet market demand.

Alternative 2

In this alternative, 2,031 acres would be converted to even-aged management. Forest health and commercial productivity would be improved by the removal of dwarf mistletoe-infected trees, trees infected by disease, and by creating younger, faster-growing forests.

Two-aged management will be prescribed on 33 acres in this alternative in Unit 315. A minimum of 50 percent of the basal area will be retained in patches or individual trees generally located along boundaries and setting breaks. This will create a stand of two or more distinct age (size) classes, and provide a wildlife travel corridor through the unit.

An additional 442 acres would be managed with an uneven-aged system by removing up to 40 percent of the basal area in individual trees dispersed throughout the stand. This would improve helicopter yarding economics, and retain some of the old-growth characteristics of the forest (older trees, wider variation in tree sizes and spacing,

decadent trees, multiple canopy layers), but result in a forest with lower net commercial volume.

Alternative 3

In this alternative, 3,127 acres would be converted to even-aged management. Forest health and commercial productivity would be improved by the removal of dwarf mistletoe-infected trees, trees infected by disease, and by creating younger, faster-growing forests.

An additional 520 acres would be managed in an uneven-aged system by removing up to 40 percent of the basal area in individual trees dispersed throughout the stand. This would retain some of the old-growth characteristics of the forest (older trees, wider variation in tree sizes and spacing, decadent trees, multiple canopy layers), but result in a forest with lower net commercial volume.

Alternative 4

In this alternative, 1,327 acres would be converted to even-aged management. Forest health and commercial productivity would be improved by the removal of dwarf mistletoe-infected trees, trees infected by disease, and by creating younger, faster-growing forests.

Table 3-42. Previous and Proposed Timber Harvest for Each Alternative

		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Proposed Timber Harvest for this Project and Cumulative Effects					
Acres of harvest units proposed for this project	**Even-aged Management**	0	2,031	3,127	1,327
	Two-aged Management	0	33	0	0
	Uneven-aged Management	0	442	520	0
Effects on Suitable Forest Land					
Acres of Suitable Forest		31,622	31,622	31,622	31,622
Acres of Previous Harvest on Suitable Forest		4,233	4,233	4,233	4,233
% of Suitable Forest Acres Proposed for this Project		0	8	12	4
Cumulative % of Suitable Forest Acres Managed		13	21	25	17

Cumulative Effects

Past Timber Harvest within the Study Area

The catalog of past events documents a conversion of 4,622 acres from old-growth forest to second-growth forest within the Central Kupreanof Project Area and approximately 4,233 acres of these lands are on forested land within the suitable timber base. Forest-wide, existing second-growth forest within the suitable timber base has been scheduled as part of the timber supply. Thinning of second-growth or conversion to uneven-aged management may occur. All of the proposed harvest units that have an uneven-aged management prescription have subsequent entries planned. The Central Kupreanof EIS is the only EIS on the current five-year timber sale plan for VCUs 4260, 4271, 4290, 4360, and 4380.

Past and Future Timber Harvest on Kupreanof Island

Since 1910 there has been approximately 41,511 acres of timber harvested on National Forest and Private Lands on Kupreanof Island. The Tongass Five Year Sale Plan shows a potential for two additional planned EISs on Kupreanof Island. One EIS is planned for the Lindenberg Peninsula and the other is planned for the Bohemia Mountain area.

Access and Travel Management

The recommendation from the ATM EA includes road closures. The road segment that is recommended for decommissioning will return to natural vegetation over time. These recommendations will are analyzed in the District's ATM EA.

Soils and Geology

Introduction

Soils form the foundation of the forest ecosystem and have evolved with the climate and vegetation. The integrity and stability of a soil determine the long-term productivity of the vegetation. The region's cool growing season and abundant rainfall greatly influence soil characteristics. Under these conditions, organic material decomposes slowly and tends to accumulate. Soils are formed in either mineral materials (sand, silt, and clay) or organic material (decayed plant materials).

Geology

The parent material on Kupreanof Island is largely dominated by basaltic and andesitic volcanic materials. Rocks identified include breccia, tuff, rhyolite, minor carbonates, and also include metamorphosed rocks such as gneiss, greenstone, and greenschist (Nowacki et al. 2001).

Minerals

The Bureau of Land Management's mining claim report documents many prospects and claims identified on Kupreanof Island. The project area has four known prospects or lode sites: an area east of Big John Bay, an area south of Kupreanof Mountain, Taylor Creek and Upper Taylor Creek, and Indian Point. Within these areas minor amounts of precious and base metals have been identified. Included are low levels of gold, silver, lead, mercury, pyrite, copper, molybdenum, nickel, cobalt, and zinc (Still et al. 2002).

Karst

Using the USFS GIS database 2,685 acres of karst have been identified on Kupreanof Island. Ten percent (279 acres) of those acres exist within the project area. Twelve acres occur in three proposed units (309, 310, and 312). Field reconnaissance found no signs of karst features (sink holes or caves) in these units; therefore these karst areas are classified as low vulnerability and require no special management (Forest Plan 2008, Standards and Guidelines, pg 4-23).

Soil

In Southeast Alaska, where sunlight is often limited and temperatures are cool, it is not uncommon for 250 years to elapse before a weak soil horizon forms (Krosse 1993, pg 39).

Four soil orders exist in the project area: histosols, spodosols, inceptisols, and entisols. Histosols dominate, covering over half of the project area. Spodosols account for a third of the area, leaving a fraction identified as inceptisols and entisols.

Histosols are organic soils that are typically poorly drained. Many histosols fall within the wetland category. Although these soils

contain deep organics and nutrients, timber productivity is generally low due to poor drainage and anaerobic conditions (Cowardin et al. 1992).

Soil productivity

From a resource management perspective, soil productivity (i.e., a soil's ability to support vegetative growth) and the potential loss of soils or off-site effects from erosion and landslides are the principle concerns. The productivity of soils directly or indirectly affects the productivity of other forest resources. Tree growth, wildlife and fish habitat quality, and recreation uses and potentials depend in part on the quality of soils. In Southeast Alaska, soil productivity, in terms of tree growth, is high on well-drained soils (e.g., on steep slopes and in karst areas) and decreases as latitude and elevation increase and as drainage becomes poorer.

In this project area the most productive sites are associated with mineral soils (spodosols, entisols and inceptisols) found on well-drained floodplains. They are also located where slope gradients are above 35 percent in the mid and southern sections of the project area.

Soil Disturbance

Soil disturbance is an unavoidable consequence of timber harvest and road construction. The level of disturbance varies with management practices and site characteristics.

Surface erosion occurs when soil is detached and transported by water. Most undisturbed soils in the project area are resistant to surface erosion due to a relatively thick, organic surface layer, which absorbs large quantities of water and protects the soil from displacement. If this layer is removed, the underlying soil may be subject to erosion.

Where vegetation management is proposed in the project area, the soils are relatively rich in organic matter and carbon. These are not soils at risk of losing productivity through biomass removal.

Erosion can occur on a minute scale (raindrop splash erosion) or on a large scale (mass movement) such as a landslide. The type of yarding equipment used will influence the erosion potential. Helicopter-yarding causes the least amount of disturbance to the soil surface. Shovel-yarding usually does not disturb the soil surface if slash is used under the tracks of the machine. Cable-yarding may expose some mineral soil where trees are partially suspended, but the effects are minimized through log suspension requirements and the application of BMP 13.9.

Mass Movement

Mass movement is the dominant process of natural erosion and slope reduction in Southeast Alaska (Swanston 1969). Mass movement occurs where the topography is steep and the soil materials are weakened to the point that they can no longer resist the downslope component of gravity. In Southeast Alaska, areas of natural mass

wasting are associated with steep slopes within narrow V-notch tributary drainages and the steep, upper sideslopes of U-shaped valleys.

A slope's stability is influenced by soil strength, soil depth, groundwater accumulation, slope gradient, and vegetation characteristics. Visible field indicators of unstable soils include slide scarps, jack-strawed trees, and a distinct change to relatively young plants or pioneer species.

Mass movement indices (MMIs) have been assigned to each soil mapping unit in the project area according to the relative potential for mass movement. The indices are based primarily on slope, but other factors such as drainage, bedrock characteristics, soil characteristics, existing landslides, and vegetation are also considered. Very high hazard soils are subject to additional investigation prior to or during the sale preparation. Identified unstable soils are avoided during sale preparation. Table 3-43 displays acres of proposed harvest by soil mass movement index for each alternative.

At the Forest Plan level, slope gradients of 72 percent or more are removed from the tentatively suitable timber base due to high risk of soil mass movement. At the project planning level, the Forest Supervisor or District Ranger may approve timber harvest on slopes greater than 72 percent or more on a case-by-case basis. Their decision is based on the results of a Soil Stability Investigation Report, an on-site analysis of slope stability and an assessment of potential impacts of accelerated erosion on downslope and downstream fish habitat.

To meet Forest Plan requirements, Soil Stability Investigation Reports for proposed harvest units with slopes greater than 72 percent have been completed and are filed in the project record. As a result of these investigations, two unit boundaries were adjusted (Units 6 and 502), full suspension was recommended for one proposed timber harvest unit (Unit 261), a minimum of partial suspension was recommended for three proposed timber harvest units (Units 5, 900 and 901) and road locations in or adjacent to four proposed timber harvest units were modified (Units 233, 234, 275 and 276). Other field investigations resulted in the modification of eleven additional unit boundaries (Units 219, 229, 230, 231, 235, 246, 263, 264, 266, 285 and 286), the modification of seven additional proposed road locations (Units 243, 246, 260, 263, 264, 268, and 280), recommendations for no road construction in two proposed harvest units (216 and 217), additional management recommendations for proposed units that have evidence of landslides (217 and 277) and a specification of silvicultural prescription or yarding method to protect soils in twelve units (207, 216, 217, 219, 231, 235, 249, 260, 261, 265, 266 and 285).

These changes were made to address slope stability, the presence of landslides and access concerns.

Table 3-43. Acres[1] of MMI in Proposed Units by Alternative

MMI Class	Alt. 1	Alt. 2	Alt. 3	Alt. 4
1– Low	0	764	1,295	631
2 – Moderate	0	1,288	1,701	577
3 – High	0	442	634	119
4 – Very High[2]	0	10	17	0
Total Acres	**0**	**2,504**	**3,647**	**1,327**

1 Variations in acres are the result of rounding.
2 Soil stability analyses determined these soils to be stable.

Landslides

In the project area 16 landslides were identified using the USFS GIS landslide database. The slides identified occupy 0.03 percent (42 acres) of the project area and are inventoried as having occurred between 1960 and 1995. Fourteen of the slides are not associated with timber harvest and occurred on all MMIs. The two slides that did occur after a harvest are smaller in size (traveling less distance) and on lower gradients than the naturally induced slides (less than 52 percent gradient) (Table 3-44).

Most landslides occur during or after heavy rainfall when soils become saturated (Swanston 1995). The areas typically considered hazardous or most prone to landslides are those with steep slopes and soils with distinct slip-planes, such as when compacted glacial till or bedrock are sloping parallel to the surface (Rib and Liang 1978). During heavy rainfall these areas can fail, especially if previously disturbed by blasting for rock pits, road pioneering, side casting of excavated material, or ground-based logging.

Table 3-44. Comparison of Landslides within the Central Kupreanof Project Area that are associated with Harvested Areas and those that Occurred Naturally

	Number of Slides	Total Acres from Slides	Average Acres per Slide	For the Central Kupreanof Project Area
Harvest associated slides	2	1.4	0.7	Natural slides are 4.1 times larger than those associated with harvests.
Natural slides (non-harvest) areas	14	40.9	2.9	

Soil Quality Standards

Soil quality standards are a means to quantify detrimental soil conditions which in turn have long-term effects on soil productivity. The Forest Service Manual states that the total acreage of all detrimental soil conditions should not exceed 15 percent of an activity area (FSM 2554). The activity area for this analysis includes the proposed harvest units.

The number of acres disturbed by timber harvest is estimated at three percent of the total acres harvested where partial suspension or shovel yarding was used (Landwehr and Nowacki 1999). Disturbance due to temporary roads is based on a 40-foot road corridor (to account for both cutslope and fillslope) and is equivalent to 4.85 acres per mile of road. Soil disturbances associated with system (NFS) road construction are not considered part of the productive land base and therefore are not included in the calculation of detrimental soil conditions (Soil Quality Standards).

Harvest has occurred on three percent of the project area (4,615 acres). Assuming that the soil on three percent of these acres is disturbed due to previous harvest, approximately 139 acres of disturbed soils exist in the project area.

Resource Analysis Area

The proposed harvest units are the spatial analysis area used to analyze direct and indirect effects on soil. The project area (VCUs 426, 427.1, 429, 436, and 438) is the spatial analysis area used to analyze cumulative effects.

The unit of measure used to assess direct, indirect and cumulative effects to the soil resource is acres of long-term soil disturbance. Soil disturbance may be a result of timber harvest, temporary road construction, mass movement or landslides.

To summarize, effects are estimated based on the following measures:

- Estimated acres of detrimental soil conditions in harvest units due to temporary road construction and yarding activities,
- Acres of timber harvest on slopes over 72 percent, acres of timber harvest by MMI Class and an estimate of future landslides acres as a result of management activities, and
- Cumulative acres of soil removed from productivity by roads, detrimental soil conditions within harvest units, and landslides.

Direct and Indirect Effects

Soil productivity would decrease due to construction of roads because land is taken "out of production" (i.e., removed, covered over, or compacted). Erosion would increase from the construction of roads because of the destabilizing effect of cuts, fills, and drainage alterations, and the lack of protective vegetation cover on road surfaces and other disturbed areas. However, the area of detrimental soil disturbance from new temporary road construction within the proposed units (16.1 acres) and timber harvest (109 acres) is estimated to be three percent of the harvest unit acres - well below the 15 percent standard (FSM 2554).1

Rock quarries, similar to system roads, are part of the long-term infrastructure and are not considered detrimental soil disturbances. However, it is recognized that any new rock quarries developed or expanded to support new construction and road maintenance will result in an irretrievable loss of soil resources. The area footprint created by existing quarry expansion, or the development of a new quarry, will not exceed 5 acres.

The short-term risk of erosion and loss of soil productivity associated with temporary road construction and logging would be minimized in all alternatives by avoiding unstable slopes and implementing best management practices. These practices include: (1) logging system

[1] This is assuming that the alternative proposing the most road construction and harvest is selected (Alternative 3) and 3,647 acres are harvested using partial suspension or shovel yarding.

designs specific to each unit to minimize soil disturbance and (2) intensive timber sale contract administration to ensure compliance.

Table 3-45. Estimated Acres of Detrimental Soil Conditions within the Proposed Harvest Units as a result of Project Implementation

Soil disturbance activity	Alt 1	Alt 2	Alt 3	Alt 4
Ground yarding[1]	0	75	109	40
Proposed temporary road construction [2]	0	13.8	16.1	8.6
Estimated acres of landslides[3]	0	28	38.5	14
Total acres of new detrimental soil conditions	**0**	**116.8**	**163.6**	**62.6**

[1] Estimated disturbance acres from ground yarding are calculated by multiplying total harvest acres by 3 percent (Landwehr and Nowacki 1999).
[2] Estimated disturbance acres from temporary road construction is calculated by multiplying proposed temporary miles by 4.85 (to account for a 40-foot road corridor including cutslope and fillslope).
[3]Landslide totals are an estimate for the next 35 years.

All alternatives exceed Forest Plan Soil Standards and Guidelines. In other words, greater than 85 percent of the harvest units and the project area would be left in a condition of acceptable productivity potential for trees and other managed vegetation following harvest activities.

Table 3-46. Miles of Proposed NFS and Temporary Road by Alternative and MMI Class within the Central Kupreanof Project Area

MMI Class	Alt. 1	Alt. 2	Alt. 3	Alt. 4
1 – Low	0	4.6	11.9	1.5
2 - Moderate	0	5.6	13.8	0.7
3 – High	0	1.5	5.3	0.1
4 – Very high[1]	0	0	0.2	0

[1] Soil stability analyses determined these soils to be stable.

Alternative 1

Under Alternative 1 no timber harvest or road building would take place and no soil disturbances would result from new management activities. Landslides would continue to occur in unharvested areas and existing harvested areas. Vegetation in harvested areas would continue to grow and increase soil stability on those sites. Detrimental soil conditions would remain within Region 10 Soil Quality Standards.

Alternative 2

Of the three action alternatives, this alternative would have the second greatest effect to soil productivity.

The total area of detrimental soil disturbance within the proposed harvest units would be approximately 117 acres due to timber harvest, temporary road construction and landslides that result from timber harvest activities (Table 3-45). All harvest units would meet Region 10 Soil Quality Standards.

Approximately 10 acres of harvest is proposed on very high hazard soils in Unit 901 (Table 3-43). A slope stability investigation found these acres within the unit boundary to be stable. Helicopter yarding is proposed on these soils.

No temporary road construction is proposed on MMI-4 soils and 1.5 miles are proposed on MMI-3 soils (Table 3-46).

Alternative 3

Of the three action alternatives, this alternative would have the greatest effect to soil productivity.

The total area of detrimental soil disturbance would be about 164 acres due to timber harvest, temporary road construction and landslides that result from timber harvest activities (Table 3-45). All harvest units would meet Region 10 Soil Quality Standards.

Approximately 17 acres of timber harvest is proposed on very high hazard soils in Units 261 and 901. Slope stability investigations found these acres within the unit boundaries to be stable. Helicopter yarding is proposed on these soils.

Approximately 0.2 mile of temporary road construction is proposed on MMI-4 soils and 5.3 miles are proposed on MMI-3 soils (Table 3-46).

Alternative 4

Of the three action alternatives, this alternative would have the least effect to soil productivity.

The total area of detrimental soil disturbance would be about 63 acres due to timber harvest, temporary road construction and landslides that result from timber harvest activities (Table 3-45). All harvest units would meet Region 10 Soil Quality Standards.

No harvest or temporary roads are proposed on MMI-4 soils in this alternative. One-tenth of a mile of temporary road is proposed on MMI-3 soils (Table 3-46).

Cumulative Effects

The cumulative effects analysis area for soils is the project area. The Catalog of Events for Kupreanof Island (a list of projects by year and VCU that have been implemented on Kupreanof Island) was a tool used for this analysis (Appendix C). Cumulative effects of the proposed actions on long-term soil productivity are directly related to the amount of soil disturbance that occurs through time as a result of natural events, temporary road construction, and resource management.

Existing Condition

Detrimental soil disturbance incurred from past management activities (temporary road construction and timber harvest) and natural events (landslides) cover approximately 253 acres or less than one percent of the project area. Existing NFS roads have disturbed about 310 acres of soil, also less than one percent of the project area (Table 3-47).

Alternative 1

Alternative 1 proposes no new timber harvest or construction of roads. No additional acres of detrimental soil are expected to result from the implementation of reasonably foreseeable future actions. The project area meets R10 Soil Quality Standards (FSM 2554.03-10).

Based on landslide rates from Swanston and Marion (1991), landslide disturbance would continue at an estimated rate of 1.2 acres/year, totaling 42.3 acres, over a 35-year period in the project area (Table 3-47). Vegetation in previously harvested areas would continue to grow and add root mass and stability to the soil, thus landslide frequency would likely decline over time in the harvested areas (Brardinoni et al. 2002).

Alternative 2

In addition to the impacts described for Alternative 1, the implementation of Alternative 2 would include the effects described in the Direct and Indirect Effects section. Cumulative detrimental soil conditions from all past, present and future activities would be about 386 acres (detrimental soil conditions for Alternative 2 plus the existing condition) (Table 3-47). All harvest units and the project area would meet R10 Soil Quality Standards as proposed.

Based on landslide rates from Swanston and Marion (1991) landslide disturbance in the harvested areas would occur at an estimated rate of 0.02 acre/year, totaling about 0.8 acres over a 35-year period. For the entire project area landslide disturbance is estimated at 1.22 acres/year and 43.1 acres over a 35-year period.

Alternative 3

In addition to the impacts described for Alternative 1, the implementation of Alternative 3 would include the effects described in the Direct and Indirect Effects section. Cumulative detrimental soil conditions from all past, present and future activities would be about 430 acres (detrimental soil conditions for Alterative 3 plus the existing condition) (Table 3-47). All harvest units and the project area would meet R10 Soil Quality Standards as proposed.

Based on Landslide rates from Swanston and Marion (1991) landslide disturbance in the proposed harvest areas would occur at an estimated rate of 0.03 acre/year, totaling about 1.1 acres over a 35-year period cumulatively landslide disturbance for the entire project area is estimated at 1.23 acres/year and 43.4 acres over a 35-year period.

Alternative 4

In addition to the impacts described for Alternative 1, the implementation of Alternative 4 would include the effects described in the Direct and Indirect Effects section. Cumulative detrimental soil conditions from all past, present and future activities would be about 346 acres (detrimental soil conditions for Alterative 4 plus the existing condition) (Table 3-47). All harvest units and the project area would meet R10 Soil Quality Standards as proposed.

Based on landslide rates from Swanston and Marion (1991) landslide disturbance in the proposed harvest areas would continue at an estimated rate of 0.01 acre/year, totaling about 0.4 acre over a 35-year period). Cumulatively landslide disturbance for the entire project area is estimated at 1.21 acres/year and 42.4 acres over a 35-year period.

By implementing the BMPs outlined on the unit and road cards, all units will meet Forest Plan Standards and Guidelines and Regional standards.

Table 3-47. Cumulative Effects - Summary of Existing Soil Disturbance within the Central Kupreanof Project Area and Disturbance that May Result from Project Implementation

	Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Detrimental Disturbance (acres)					
Temporary road	73[1]	0	19	30	11
Yarding disturbances[2]	138	0	71	104	40
Landslides[3]	42	42	43	43	42
Total detrimental	**253**	**42**	**133**	**177**	**93**
Other disturbance (acres)					
NFS road	310[4]	0	34	122	0
Total disturbance	**563**	**42**	**167**	**299**	**93**

[1]Estimate is based on 15 miles of closed road within the project area x 4.85 acres/mile.
[2]Shovel and cable yarding estimated at 3 percent disturbance and helicopter yarding estimated at 2 percent based on Landwehr and Nowacki's work (1999). Existing yarding disturbance is acres of past harvest x 3 percent.
[3] Landslide totals for Alternatives 1-4 are an estimate for the next 35 years.
[4] Estimate includes 64 miles of existing open road within the project area x 4.85 acres/mile.

Projects Common to all Alternatives

In conjunction with the analysis of the project area for timber harvest, the Petersburg Ranger District is conducting a road analysis on the Kake road system to identify the minimum road system needed for safe and efficient travel and for administration, utilization and management of National Forest System lands. Recommendations for road storage, decommissioning, closure and maintenance schedules will be analyzed in the PRD ATM EA.

No other actions, other than Projects Common to all Action Alternatives (see the next section), are planned in the foreseeable future within the project area.

Effects of Projects Common to all Action Alternatives

Fisheries/ Hydrology Projects

The storage of roads and the associated removal of culverts and bridges on the Kake road system will help improve drainage patterns and eliminate plugged culverts, stream diversions and the risk of road failures at stream crossings. Implementation of these projects is dependent on the analysis and decisions made in another NEPA analysis, the District's ATM plan.

Recreation

The maintenance of four recreational hiking trails should not have any negative effects on soil. In contrast, they will likely reduce erosion and soil loss.

No effects to soils are expected as a result of maintenance work on Big John Bay Cabin.

Invasive Plants

Handpulling invasive plants will disturb soil in the immediate proximity of the activity, but no long-lasting negative effects are expected.

Silviculture and Wildlife

Precommerical thinning 325 acres of young growth stands to benefit wildlife is not expected to negatively affect soil resources.

Transportation

Any new rock quarries developed or expanded to support road maintenance will result in an irretrievable loss of soil resources. With the expansion of an existing quarry, or the development of a new one, the area footprint will not exceed 5 acres. In general, scheduled road maintenance will be benefit soil resources by maintaining drainage and reducing the risk of road failures.

Microsales

The implementation of a Microsale program will have no effect on soils due to the program's limited scale.

Wetlands

Introduction

Wetlands are sites which generally have both saturated soils for a portion of the growing year and vegetation that is adapted to wet sites. They are valued for their physical, chemical and biological functions. Wetlands moderate flooding, reduce runoff and sedimentation, provide wildlife and plant habitat, and may help sustain stream flow during dry periods. Physical functions may include flood conveyance, surface and ground water regulation, sediment retention, and temperature moderation. Chemical functions may include nutrient storage, pH moderation, and carbon storage. Biological functions include habitat for terrestrial, aquatic, and marine plants and animals. In addition, forested wetlands are an important component of the forest land base.

The Forest Service is required by Executive Order 11990 and Section 404 of the Clean Water Act to preserve the natural and beneficial values of wetlands wherever practicable when carrying out its land management responsibilities. Executive Order 11990 and subsequent regulations also require federal agencies to avoid new road construction on wetlands whenever there is a practicable, environmentally-preferred alternative.

Due to the extensive nature of wetlands in Southeast Alaska, it is impossible to avoid all wetlands during road planning and construction. Instead the strategy is to avoid wetland types that are scarce in the immediate landscape, and/or those wetlands recognized as having high value, such as estuaries and tall sedge fens (TLMP 2008, 4-88). Where a wetland cannot be avoided, the impacts are to be minimized. Best Management Practices (BMP) 12.5 provides guidance for wetland identification, evaluation and protection.

Affected Environment

The Central Kupreanof project area contains a larger proportion of wetlands than much of Southeast Alaska, about 66 percent. Five different wetland types make up the project area's 100,333 wetland acres (Table 3-48). Resource values associated with these wetlands vary, depending on biological qualities, proximity to water bodies, and the position on the landscape.

Specific descriptions for the wetland categories are briefly described below.

Estuarine Wetlands

Regionally, estuarine wetlands are considered high-value wetlands. Estuaries are intertidal zones where brackish saltwater mixes with fresh water from rivers or streams. They provide high value habitat for vegetation, fish and wildlife. There are two types of estuarine wetlands: emergent wetlands in the upper tidal zone, and intertidal, regularly flooded zones. The emergent wetlands are characterized by grasses and sedges, especially tufted hairgrass, Lynghy's sedge and dune wild rye in the upper tidal zone. The intertidal, regularly flooded zone is comprised largely of aquatic algal beds and rocky or unconsolidated shore. The Forest Service only manages the wetlands above mean high tide, as it is not chartered to manage ocean area (TLMP 2008).

Emergent Short Sedge Wetlands

Sedge fens, dominated by Sitka sedge but characterized by a diverse community of sedges with a variety of forbs and occasional stunted trees (usually spruce or hemlock) are considered high-value wetlands. Soils are typically deep organic muck, often with thin layers of alluvial soil material. They occur in landscape positions where they receive nutrient-rich runoff from adjacent slopes creating somewhat richer conditions than bogs or sphagnum muskegs. These wetlands function as areas for recharge of groundwater and streams, deposition and storage of sediment and nutrients, and for waterfowl and terrestrial wildlife habitat, including black bear, mink, river otter, and beaver. Many sedge fens contain beaver ponds that often provide high quality waterfowl and salmon rearing habitat.

Forested Wetlands

Forested wetlands include a number of forested plant communities with hemlock, cedar, or mixed conifer overstory, and a young tree, shrub, and herbaceous layer understory. Forested wetlands are typically on poorly or very poorly drained hydric mineral soils, but generally have woody vegetation that exceeds 20 feet in height. They are most common on broad glacial valley bottoms and on gently sloping hill slopes or benches. These wetlands function as recharge areas for groundwater and streams, and for deposition of sediment and nutrients. Some forested wetlands support merchantable timber stands.

Muskeg/Forested Wetland Mosaic

These wetlands are characterized by small patches of muskegs and forested wetlands (as described above) arranged in a mosaic pattern on the landscape. These areas have vegetative properties of both muskegs and forested wetlands, but function somewhat differently with respect to habitat due to their small size and spatial arrangement.

Moss Muskeg Wetlands

Moss muskeg wetlands are most commonly found in broad valley bottoms and on rounded hilltops. They are dominated by sphagnum moss, with a wide variety of other plants adapted to very wet, acidic, organic soils and typically contain stunted lodgepole pine and western hemlock less than 15 feet tall. These wetlands function as areas for

recharge of groundwater and streams and for deposition and storage of sediment and nutrients. They are a valuable source of biological and vegetative diversity.

Table 3-48. Wetland Habitat Types in the Central Kupreanof Project Area.

Wetland Type	Acres in Project Area	Percent of Project Area
Muskeg/forested wetland mosaic	62,327	40.9
Moss muskeg	22,396	14.7
Forested	14,983	9.8
Emergent short sedge	605	0.4
Estuarine	22	0.01
Total Wetland Acres	**100,333**	**65.81**

Management Activities on Wetlands

Many of the forested wetland soils are capable of supporting forests suitable for timber production and were included in the suitable timber base during the analysis of the Forest Plan. However, site productivity for tree growth is generally lower than on sites with better drainage. Regeneration is expected to occur within five years, just as with other forested sites.

Timber Harvest

Harvesting timber from forested wetlands causes a temporary increase in soil moisture until equivalent transpiration and interception surfaces are reestablished. Table 3-49 displays the number of wetland acres previously harvested within the project area as well as the number of acres proposed in the harvest units.

Table 3-49. Wetland Acres Previously Harvested and those Proposed for Harvest within the Central Kupreanof Project Area

Wetland Type	Existing Managed Stands	Alt 1	Alt 2	Alt 3	Alt 4
Emergent short sedge	0	0	0	0	0
Forested wetland/moss muskeg mosaic	163	0	14	14	8
Forested	391	0	174	310	101
Moss muskeg	2	0	0	0	0
Total Harvest	**556**	**0**	**188**	**324**	**109**

Road Construction

Of the 79 existing miles of road in the project area, 37 miles (47 percent) cross wetlands (Table 3-50). This equates to approximately 179 acres of wetland being replaced by roads within the project area, assuming a 40-foot road corridor includes cutslope and fillslope (Table 3-51). The existing roads do not cross any estuary or tall sedge fen areas (i.e., high value wetlands). However, 0.05 mile and 0.3 mile sections of existing road cross an emergent short sedge fen (totaling 1.7 acres of this high value wetland type lost to road construction).

The amount, frequency and distribution of wetlands in the project area make it impossible to avoid new road construction across forested wetlands. Wetland avoidance is discussed on the individual road cards.

Table 3-50 displays the miles of proposed road that would cross wetlands by alternative and Table 3-51 shows the same data as acres lost to road construction.

Table 3-50. Miles of Road Crossing Wetlands within the Project Area

Road Type	Wetland type	Existing	Alt 1	Alt 2	Alt 3	Alt 4
Reconstructed	Emergent short sedge	-	0	0	0.07	0
	Forested	-	0	0.27	0.6	0.26
	Muskeg/forested wetland mosaic	-	0	0.41	1.44	0.41
	Moss muskeg	-	0	0.15	0.15	0.15
Temporary	Emergent short sedge	-	0	0	0	0
	Forested	-	0	0.31	0.68	0.18
	Muskeg/forested wetland mosaic	-	0	0.36	0.36	0.17
	Moss muskeg	-	0	0	0	0
System	Emergent short sedge	0.35	0	0	0	0
	Forested	8.87	0	0.49	1.1	0
	Muskeg/forested wetland mosaic	24.97	0	0.36	1.95	0
	Moss muskeg	2.78	0	0.47	0.71	0
Total miles of road crossing wetlands[1]		**36.97**	**0**	**2.83**	**7.06**	**1.17**

[1]Numbers may not total exactly due to rounding.

Table 3-51. Past, Proposed and Future Foreseeable Acres of Wetlands lost to Road Construction[1].

Road Type	Wetland type	Past losses	Alt 1	Alt 2	Alt 3	Alt 4	Foreseeable losses
Reconstructed	Emergent short sedge	-	0	0	0.34	0	0
	Forested	-	0	1.3	2.9	1.3	0
	Muskeg/forested wetland mosaic	-	0	2.0	7.0	2.0	0
	Moss muskeg	-	0	0.7	0.7	0.7	0
Temporary	Emergent short sedge	-	0	0	0	0	0
	Forested	-	0	1.5	3.3	0.9	0
	Muskeg/forested wetland mosaic	-	0	1.7	1.7	0.8	0
	Moss muskeg	-	0	0	0	0	0
System	Emergent short sedge	1.7	0	0	0	0	0
	Forested	43	0	2.4	5.3	0	0
	Muskeg/forested wetland mosaic	121.1	0	1.7	9.5	0	0
	Moss muskeg	13.5	0	2.3	3.4	0	0
Total acres of wetlands lost to road construction[2]		**179.3**	**0**	**13.7**	**34.2**	**5.7**	**0**

[1]Estimated disturbance acres from road construction is calculated by multiplying miles by 4.85 (to account for a 40-foot road corridor including cutslope and fillslope).
[2]Numbers may not total exactly due to rounding.

Wetland Avoidance

Executive Order 11990 and subsequent regulations require federal agencies to avoid new road construction on wetlands whenever there is a practicable, environmentally-preferred alternative. For instance, building road across wetlands is environmentally preferred when compared to road construction across steep slopes. The forested wetland acres on the Central Kupreanof project area often include

stands of commercial timber and are managed for their timber resources. The most economical way to access this timber involves building road.

All action alternatives and individual road locations avoid wetlands to the extent practicable, proposing less than 25 percent of the project area's reconstructed, temporary and NFS road construction on wetlands. More specifically, 20 percent, 17.5 percent and 24.4 percent of all proposed roads cross wetlands in Alternative 2, 3 and 4, respectively. Site specific wetland avoidance is documented on the road cards for NFS road segments and the unit cards for temporary road segments.

Resource Analysis Area

The spatial analysis area for direct, indirect and cumulative effects is the project area (VCUs 426, 427.1, 429, 436, and 438).

Direct and Indirect Effects

Each action alternative includes wetlands within proposed harvest units (Table 3-49). The effects of timber harvest on the beneficial functions of wetlands, in most cases, are expected to be temporary. Harvest has occurred and is planned in all but one of the wetland types (emergent short sedge) present in the project area. The wetland type with the most proposed harvest is forested wetlands (Table 3-49).

The greatest direct effect to wetlands would be the placement of fill material and drainage structures associated with the construction of new roads. This is a long-term effect on the wetland area covered by the road prism. Considerations of road location include, cost, existing technology, and logistics as they apply to a project (TLMP 2008, pg 4-88). When possible, roads are located to avoid wetlands.

Another direct effect of road building on wetlands is the slight alteration of soil drainage for several feet on either side of the prism evidenced by vegetation changes in these areas. Drainage ditches collect and divert overland flow and shallow surface flow to the nearest stream channel. This has minimal effect on soil wetness in the wetlands above and below the road prism (McGee 2000).

Expanding existing or creating new rock pits, and selecting logs for stringer bridges needed in construction may be necessary to complete transportation plans for this project. These activities will follow Forest Plan direction with regards to location, design, and construction (TLMP 2008, pgs 4-80 through 4-88).

Proposed roads would cross forested wetlands and muskeg/forested wetland mosaics in all three action alternatives (Table 3-50). Forested

wetlands and muskeg/forested wetland mosaics would be crossed by new temporary road construction in Alternatives 2, 3 and 4. Proposed system roads would cross forested wetlands, muskeg/forested wetland mosaics and moss muskeg in Alternatives 2 and 3 (Table 3-50). No system roads are proposed for Alternative 4. Changes in wetland flows resulting from road construction are expected to be minimal.

Alternative 1

No wetland would be impacted under Alternative 1 as a result of harvest or road construction. Vegetation on forested wetlands harvested in the past would continue to grow toward hydrologic maturity. Wetlands impacted by roads in the past would receive minimal use. Vegetation will occupy ditchlines and in the case of closed roads the roadbed may be occupied by red alder with eventual establishment of conifers. The road prism would remain in an upland condition. Road ditches, where present, will support a variety of upland and wetland vegetation depending on local conditions and seed sources. Hydrologic and vegetation effects would remain limited beyond the road prism (Glaser 2000).

Effects Common to all Action Alternatives

Timber harvest is proposed on wetlands in all action alternatives. Harvest activities are expected to have a minimal and short-term effect on wetland soil moisture. Removal of timber would lead to a short-term increase in soil saturation until second-growth establishes evapotranspiration surfaces similar to pre-harvest conditions. Effects on soil moisture would likely be less in areas where partial cutting is utilized. The proposed harvest in all action alternatives would not pose a long-term negative impact to wetlands in the project area.

The effects of road construction on wetland hydrology and vegetation depend largely on the landscape position of and the substrate (soil) within the wetland. Wetlands located on ridgetops serve to donate water downslope. Soils in these landscape positions are typically peat soils that are shallow (less than 20 inches thick) over bedrock. Because these landscape positions receive more rain than lower slope positions and the soils have a higher water holding capacity, the effects of constructing a shot rock road across these wetlands is usually limited to the area of wetland buried by the shot rock, and effects to vegetation are limited to within a few meters of the shot rock (Glaser 2000).

Road crossings mid-slope and lower slope landscape positions have a greater chance of intercepting soil and surface water as the water moves downslope. While application of BMPs provide some assurance that surface water streams will not be diverted by roads, soil water is sometimes captured and diverted to the nearest stream or drainage-relief culvert. However, due to the high levels of precipitation and high

moisture contents, the intercepted soil water does not translate into drier soils downslope.

In mid-slope and lower slope landscape positions, the effects of roads on wetlands can extend just beyond the road prism and substrate plays an increasingly important role. Thicker peat and mineral soils occur in these landscape positions. Thick peat soils permeate slowly and have an extremely high water-holding capacity. Effects on these soils are limited to within a few meters of the cutbank and toe of fill (Kahklen and Moll 1999). Although soil moisture levels beyond the road cut slopes and fill slopes would change, the soil moisture levels are not expected to change so much that the wetland (outside the disturbed soil corridor) would develop into an upland site.

Alternative 2

Alternative 2 proposes to harvest timber from approximately 188 acres of wetland with the majority of those acres being forested wetland (174 acres) (Table 3-49). Trees growing on these wetlands would likely grow slower than trees on upland sites. Soil moisture would temporarily increase as described in Effects Common to All Action Alternatives.

Road construction under Alternative 2 would convert approximately 14 acres of wetland habitat to road (Table 3-51).

Alternative 3

Alternative 3 proposes to harvest timber from approximately 324 acres of wetland with the majority of those acres being forested wetland (310 acres) (Table 3-49). Trees growing on these wetlands would likely grow slower than trees on upland sites. Soil moisture would temporarily increase as described in Effects Common to All Action Alternatives.

Road construction under Alternative 3 would convert approximately 34 acres of wetland habitat to road and has the potential to affect the most wetland acres of all the action alternatives (Table 3-51).

Alternative 4

Alternative 4 proposes to harvest timber from approximately 109 acres of wetland with majority of those acres being forest wetland (101 acres) (Table 3-49). Trees growing on these wetlands would likely grow slower than trees on upland sites. Soil moisture would temporarily increase as described in Effects Common to All Action Alternatives.

Road construction under Alternative 4 would convert approximately six acres of wetland habitat to road (Table 3-51).

Cumulative Effects

The cumulative effects analysis area is the project area. The Catalog of Events for Kupreanof Island (a list of projects by year and VCU that have been implemented on Kupreanof Island) was referenced to determine cumulative effects on wetlands in the Central Kupreanof project area (Appendix C).

The cumulative effects analysis considers the past, proposed and future foreseeable conversion of wetland to roads. The effects of past wetland harvest (approximately 556 acres) and currently proposed harvest discussed above are expected to be temporary with wetland function and habitat characteristics being restored through the natural processes of vegetation growth and succession. The effects to wetlands from road construction may be long lasting; however, they are expected to be limited due to the relatively low number of wetland acres planned for conversion to road and the extensive nature of wetlands in the project area. If the alternative with the most acres of wetland conversion were implemented (Alternative 3), a total of 213.5 acres of wetland would be converted to road (34.2 acres of new construction in addition to the existing condition).

Projects Common to all Alternatives

In conjunction with the analysis of the project area for timber harvest, the Petersburg Ranger District is conducting a road analysis on the Kake road system to identify the minimum road system needed for safe and efficient travel and for administration, utilization and management of National Forest System lands. Recommendations for road storage, decommissioning, closure and maintenance schedules will be analyzed in the District's ATM EA.

No other actions, other than Projects Common to all Action Alternatives (see the section after next), are planned in the foreseeable future within the project area.

Mitigation

Section 313 of the Clean Water Act and Executive Order 12088 require that Best Management Practices (BMPs) are consistent with State Forest Practices and other applicable State Water Quality Regulations be used to mitigate the impacts of land-disturbing activities. Site-specific application of these BMPs are designed with consideration of geology, land type, hydrology, soil type, erosion hazard, climate, cumulative effects, and other factors in order to protect and maintain soil, water and water-related beneficial uses. BMPs considered necessary, that were identified during the planning process, are shown on the unit cards. Additional protective measures

may be applied during timber sale layout or during harvest activities, as needed.

Effects of Projects Common to all Action Alternatives

Fisheries/ Hydrology Projects

The storage of roads and the associated removal of culverts and bridges on the Kake road system are not expected to negatively affect wetlands.

Recreation

The maintenance of four recreational hiking trails should not have any negative effects on wetlands.

No negative effects to wetlands are expected as a result of maintenance work on the Big John Bay Cabin.

Invasive Plants

Handpulling invasive plants is not expected to have any negative effects on wetlands.

Silviculture and Wildlife

Precommerical thinning 325 acres of young growth stands to benefit wildlife is not expected to negatively affect wetlands.

Transportation

Road maintenance and associated rock quarries are not expected to have deleterious effects on wetlands.

Microsales

The implementation of a Microsale program will have no effect on wetlands due to the limited scale of the program.

Scenery

Resource Analysis Area

The Central Kupreanof project area is located on Kupreanof Island, 30 air miles west of Petersburg, of approximately 152,517 acres in size and situated between upper Duncan Canal and Rocky Pass. An existing road system accesses the central portion of the project area. The analysis area boundaries include those portions of the project area visible from Visual Priority Travel Routes and Use Areas identified in the Forest Plan where scenic quality is emphasized.

Affected Environment

Southeast Alaska scenery generally includes mountains, glaciers, water, sky, weather, trees, animals, boats, people, and development. While there are an infinite number of personal interpretations of scenery, general preferences are predictable based upon cultural norms and the predominant values of society. Recreational visitors expect the forest to display natural appearing character from major travel routes and use areas.

Methods

The methods used to evaluate scenic quality for the Central Kupreanof project area is described in the Landscape Aesthetics, A Handbook for Scenery Management (U.S. Forest Service 1995). The Scenery Management System provides the framework for the inventory of the scenery resource and provides measurable standards for its management.

Visual Priority Travel Routes and Use Areas

The Forest Plan has identified specific locations where scenery is viewed from locations of high visitor use and where a greater concern for scenic quality exists. Visual priority travel routes and use areas are used to identify these locations and assess scenic conditions potentially affected by management activities. Locations visible from priority travel routes and use areas are described in scenery resource terms as the “seen area,” while “seldom seen” or “not seen” areas are defined as those locations not viewed from any position along a Visual Priority Travel Route or Use Area.

Sensitive viewing locations within the project area where scenic quality will be emphasized include the saltwater use area/small boat route of Duncan Canal and Towers Arm, Rocky Pass from Beacon Island south to Meadow Island, Big John Bay and Big John Bay cabin, the dispersed recreation use areas along Hamilton Creek and at Goose

Marsh Lake, and the Cathedral Falls, Hamilton Creek, and Big John Bay trails.

All the priority travel route and use area destinations surrounding the project area receive intermittent to moderate use over the course of the year, much of which is seasonal in nature. Those viewing the landscapes are primarily individuals involved in activities such as camping, hunting, fishing, or subsistence.

Landscape Visibility/Distance Zones

Visibility, mapped in terms of distance zones, is a measure of how visual changes are perceived in the landscape. Changes in form, line, color, and texture become less perceptible with increasing distance. Landscape visibility can also be affected by considerations such as how the viewer perceives the landscape, the duration of view, the degree of discernible detail, seasonal variations including weather, and the number of viewers. The Forest Service Scenery Management Handbook describes visibility in terms of three distance zones: foreground, middleground, and background. Areas not visible from Visual Priority Travel Routes and Use Areas are termed "not seen." Each distance zone describes the level of detail or change that can typically be perceived when viewing the landscape.

The seen area or what is visible of the Central Kupreanof project landscape from Visual Priority Travel Route and Use Areas are classified into the following categories:

- Foreground: (0 - ½ mile) – The portion of the seen area in which detail in the landscape becomes noticeable. Foliage and fine textural details of vegetation are normally perceptible within this zone. Foreground viewing locations include the trails, trailheads, and dispersed use areas in the Hamilton Creek, Cathedral Falls, Goose Lake, and Big John Bay vicinity.
- Middleground : (½ - 3 to 5 miles) - The portion of the seen area in which details of foliage and fine textures cease to be perceptible and objects in the landscape are perceived mainly by their form. Vegetation appears as outlines or patterns. Middleground views of the project area are confined to a prominent forested ridgeline visible from portions of Big John Bay and Rocky Pass.
- Background: (3-5 miles and greater) - The portion of the seen area where texture and color are weak, and landforms become the most dominant element. Background views of the mountain ranges frame the horizon in this landscape. The visual elements of line and form are dominant. Strong color contrasts of sufficient size may still be noticeable. Background viewing locations within the project area would be prominent ridge tops visible from Rocky Pass and Duncan Canal.

- Not Seen: Landscapes that are not visible from Visual Priority Travel Routes and Use Areas. Approximately 89% of the project area is categorized as not seen from Visual Priority Travel Routes or Use Areas.

Table 3-52. Project Area Visibility from Visual Priority Travel Routes or Use Areas

Visibility	Acres
Seen	12,868
Not Seen	139,649
Central Kupreanof Project Area	**152,517**

Scenic Integrity Objectives

Scenic Integrity Objectives (SIOs) provide measurable standards to assess the scenery resource based on the landform characteristics and the level of public concern, and are established by incorporating the previously defined scenery characteristics: scenic attractiveness, landscape visibility, priority viewing locations, and existing scenic integrity. In providing a measure by which to describe scenic effects these objectives include:

- High: Changes in the landscape are not visually evident to the average forest visitor.
- Moderate: Changes in the landscape may be evident to the casual observer but appear as natural occurrences when contrasted with the appearance of the surrounding landscape.
- Low: Changes in the landscape appear very evident but incorporate natural patterns of form, line, color, and texture when contrasted with the appearance of the surrounding landscape.
- Very Low: Changes in the landscape appear highly evident and may visually dominate the surrounding landscape, yet when viewed in the background distance these activities appear as natural occurrences.

Table 3-53. Project Area Acres by Scenic Integrity Objective

Scenic Integrity Objective	Acres
High	19,084
Moderate	16,177
Low	2,995
Very Low	114,261
Central Kupreanof Project Area	**152,517**

Existing Scenic Condition

Existing Scenic Integrity

Existing Scenic Integrity describes the deviation of a landscape from a natural forest condition. It excludes the context of whether the landscape is seen or not seen from Visual Priority Travel Routes and Use Areas and indicates the amount of change that has occurred in the past, and what level of change may be acceptable in the future. The relevance of Existing Scenic Integrity for this analysis is to use the present reference condition of the project area as a baseline to evaluate the acceptable desired scenic condition and cumulative effects outlined in the Forest Plan management prescription criteria. Six levels are used to describe the landscapes existing visual condition ranging from pristine to intensively modified:

- Appears Unaltered: Landscapes where development is not typically noticed by the average forest visitor. These landscapes have been altered but changes are not perceptible. For the purposes of this analysis this represents the reference condition from which change can be quantified.
- Slightly Altered: Landscapes where development is noticeable by the average forest visitor, but are natural in appearance. Changes appear to be minor disturbances.
- Moderately Altered: Landscapes where changes are easily noticed by the average forest visitor and may attract attention. Changes appear as disturbances but resemble natural patterns in the landscape.
- Heavily Altered: Landscapes where changes are very noticeable and would be obvious to the average forest visitor. Changes tend to stand out, dominating the view of the landscape, but are shaped to resemble natural patterns.

The Existing Scenic Integrity of the project area is primarily unaltered in appearance, as most of the project area remains in an undeveloped condition. The heavily altered landscapes surrounding the Hamilton Creek drainage is more a result of the extent of harvest than the direct visual appearance of the trees when viewed in close proximity or from visual priority viewing locations, and is reflective of the desired condition of the Timber Production land use designation.

Table 3-54. Project Area Acres by Existing Scenic Integrity

Existing Scenic Integrity	Acres
Appears Unaltered	103,137
Slightly Altered	4,824
Moderately Altered	12,250
Heavily Altered	32,306
Central Kupreanof Project Area	**152,157**

Desired Scenic Condition

The desired scenic condition for scenic quality is indicated by management prescriptions in the Forest Plan. All acres of land within the National Forest are assigned a LUD, each have varying degrees of acceptable alteration assigned by a Scenic Integrity Objective. Seven LUDs are located within the project area: Timber, Modified Landscape, Semi-Remote Recreation, Remote Recreation, Special Interest Area, and Old-growth Habitat Preserve and Wilderness.

Approximately 72 percent of the project area is allocated to the Timber Production LUD. The resulting appearance would reflect activities that may appear heavily altered in those areas maximizing timber production while maintaining a mostly natural appearing condition within the Modified Landscape management prescriptions. The Remote and Semi-Remote Recreation, Special Interest Area, and Old-Growth Habitat Reserve will retain their unaltered appearance where no harvest would occur. The Modified Landscape LUD area is located in the northeastern portion of the project area and includes the landscapes visible from portions of Big John Bay and Rocky Pass.

Environmental Consequences

Timber harvest within the project area visible from Visual Priority Routes and Use Areas will be designed and implemented to meet the Forest Plan adopted scenic integrity objectives. The future scenic condition of the affected landscape will be predominantly reflective of the Timber Production land use designation, where the primary goal is to manage land for the sustained long-term yield of wood.

The scenic effects will portray a greater visibility of the development associated with timber harvest than that characteristic of a natural appearing forest environment. Factors contributing to the visual magnitude associated with timber harvest include: the size of the unit, slope and aspect, distance at which it is observed, time of day and lighting conditions, prevailing weather, and the vegetative composition of the surrounding landscape. Green tree retention within units will reduce the visual effects. Additionally, all of the proposed timber harvest of any given alternative will not be seen at one time from a single location. Impacts to scenery for all alternatives will remain relatively constant over time as harvested areas regenerate and existing stands are removed.

All alternatives would meet the level of scenic quality for the affected landscapes desired condition as outlined in the Forest Plan.

Methods

The analysis boundaries for the direct, indirect, and cumulative effects includes areas where timber harvest, roads, and other associated activities resulting from the implementation of the proposed EIS are potentially viewed from any Forest Plan Visual Priority Travel Route and Use Area. Landscapes within the project area that are not seen from Visual Priority Travel Routes or Use Areas are also included in the analysis but have a lesser expectation for scenic quality.

The unit of measure for direct and indirect effects is the Forest Plan scenic integrity objectives, which represent a quantifiable measure of change to the natural appearance of the landscape. The unit of measure for cumulative effects is the total visual disturbance within a viewshed or Value Comparison Unit (VCU). The visual appearance of landscapes changes over time, previously harvested areas regenerate and return to a more natural appearing condition. It is expected that over a period of 30 years timber harvest has visually recovered to resemble a natural appearing forest condition and no longer is considered a cumulative effect.

Direct Effects of Timber Harvest and Summary of Effects by Alternative

Each of the action alternatives proposed includes a different selection of harvest units that utilizes an existing road system and the construction of new and temporary roads. Visibility of harvest units from sensitive viewing areas also varies by alternative. The following table displays the comparative difference between the alternatives as measured by the greatest potential visibility from Visual Priority Travel Route or Use Areas.

Table 3-55. Acres of Harvest in Distance Zones[1] by Alternative

Distance Zone	Alt 1	Alt 2	Alt 3	Alt 4
Foreground	0	0	0	0
Middleground	0	316	384	55
Background	0	117	336	63
Not Seen	0	2,073	2,927	1,009
Total Harvest Acres	**0**	**2,506**	**3,647**	**1,327**

[1]Foreground: (0 - ½ mile) – The portion of the seen area in which detail in the landscape becomes noticeable.
Middleground : (½ - 3 to 5 miles) - The portion of the seen area in which details of foliage and fine textures cease to be perceptible and objects in the landscape are perceived mainly by their form.
Background: (3-5 miles and greater) - The portion of the seen area where texture and color are weak, and landforms become the most dominant element.
Not Seen: Landscapes that are not visible from Visual Priority Travel Routes and Use Areas.

The overall scenic effect of the alternatives will vary in comparison to the visible harvest area as seen from sensitive viewing locations. Alternatives 2 and 3 are nearly identical in effects and would create the greatest amount of visible change to the landscape from the development of harvest units. Alternative 4 would have the least effect, harvesting approximately 118 acres potentially visible from priority viewing areas. Both Alternatives 2 and 4 would not harvest timber visible from Duncan Canal.

Alternative 1

This alternative defers timber harvest in the project area and maintains the existing visual character of the landscape. Previously harvested units within the project area would continue to mature and develop the visual characteristics of a more natural appearing and undeveloped forest.

Alternative 2

Alternative 2 proposes 2,506 acres of timber harvest by clearcut and single tree selection methods, utilizing both conventional and helicopter yarding. Eleven of the 61 units proposed totaling approximately 433 acres would be potentially visible in varying degrees from priority travel routes and use areas. Not all units however are seen from one location or at one time. Portions of Units 284 and 285, which have a Very Low Scenic Integrity Objective, would be potentially visible at a distance greater than 5 miles from locations in the southern end of Rocky Pass. The effects would achieve a Very Low SIO adopted under the Forest Plan for Timber Production area and likely would not be highly discernable due to the distance from Rocky Pass, typical weather conditions, and screening by foreground vegetation. From locations along the mid-point of Rocky Pass Units 216 and 229 also within a Timber Production LUD and a Very Low SIO designation would be potentially visible at a distance of three to five miles. Both Units 216 and 229 would likely not be highly discernable to most viewers due to the distance at which potentially visible, typical weather conditions, and screening by foreground vegetation along the shoreline of Rocky Pass.

In areas of the upper Rocky Pass and Big John Bay, Units 2, 208, 209, 313, 316, 901 and 905 would be potentially viewed at a distance of 2 to 5 miles within a Modified Landscape LUD. This designation has a slightly higher degree of acceptable alteration having a Low scenic integrity objective, where change may appear very evident but resemble natural patterns in the landscape. The overall effect of these combined units would be lessened by harvest methods of single tree selection and helicopter yarding of the most visible locations which would achieve the Forest Plan Low SIO designation.

The remaining units in this alternative are not visible from any Visual Priority Travel Route and Use Area and would achieve a Very Low scenic integrity or higher degree of scenic quality than adopted under the Forest Plan.

Alternative 3

Alternative 3 proposes 3,647 acres of timber harvest by clearcut and single tree selection, utilizing both conventional and helicopter yarding methods. This Alternative proposes the greatest amount of harvest with approximately 384 acres potentially viewed from Visual Priority Travel Routes and Use Areas. Units 2, 208, 209, 313, 316, and 901 would be all or partially visible at a distance of 2 to 5 miles from the waters of upper Rocky Pass and Big John Bay. These units would all achieve a Low SIO adopted in the Forest Plan, where timber harvest may appear very evident but resemble natural patterns in the landscape.

From locations in upper Duncan Canal north of Indian Point, Units 258, 260, 261, 262, 263, 264, and 265 may be partially evident at a

distance of 3 to 5 miles. At this distance these units would not draw attention from the viewer and resemble natural patterns in the landscape achieving a higher degree of visual quality than the Very Low scenic integrity objective adopted in the Forest Plan.

Portions of Units 284 and 285, which have a Very Low SIO, would be potentially visible at a distance greater than five miles from locations in the southern end of Rocky Pass. The effects would achieve a Very Low SIO adopted under the Forest Plan for Timber Production area and likely would not be highly visible due to the distance from Rocky Pass, typical weather conditions, and screening by foreground vegetation. From locations along the mid-point of Rocky Pass Units 216 and 229 also within a Timber Production LUD and a Very Low SIO designation would be potentially visible at a distance of three to five miles. Both Units 216 and 229 would likely not be highly visible to most viewers due to the distance at which potentially visible, typical weather conditions, and screening by foreground vegetation along the shoreline of Rocky Pass.

The remaining units in this alternative are not visible from any Visual Priority Travel Route and Use Area and would achieve a Very Low scenic integrity or higher degree of scenic quality than adopted under the Forest Plan.

Alternative 4

Alternative 4 proposes 1,327 acres of timber harvest by clearcut using conventional yarding methods. This Alternative would have the least effect upon scenery in harvesting approximately 118 acres potentially visible from priority viewing areas. Units 2, 208, 209, 313, 316 901, and 905 would be potentially viewed from locations within upper Rocky Pass and Big John Bay. A reduction of the total visible acres of harvest would be reduced by no helicopter yarding in this alternative. These units would all achieve a Low SIO adopted in the Forest Plan, where timber harvest may appear very evident but resemble natural patterns in the landscape.

Portions of Units 284 and 285, which have a Very Low SIO, would be potentially visible at a distance greater than five miles from locations in the southern end of Rocky Pass. The effects would achieve a Very Low SIO adopted under the Forest Plan for Timber Production area and likely would not be highly visible due to the distance at which viewed, typical weather conditions, and screening by foreground vegetation. Unit 229, also within a Timber Production LUD with a Very Low SIO designation, would be potentially visible at a distance of three to five miles from locations along the mid-point of Rocky Pass. These units would all achieve a Very Low scenic integrity objective as adopted in the Forest Plan

The remaining units in this alternative are not visible from any Visual Priority Travel Route and Use Area and achieve a Very Low scenic integrity or a higher degree of scenic quality than adopted under the Forest Plan.

Direct and Indirect Effects of Related Timber Harvest Activities

Utilization of the existing Little Hamilton LTF for log transfer, storage, and camp operations would result in the developed appearance and modification of the scenic environment. The marine access facility is visible in the foreground distance zone near the end of the 45006 spur on the Kake to Seal Point road (FS Road 6040) and in Hamilton Bay. For those traveling the inside waters of Hamilton Bay, the logging operations at the LTF site would not likely be noticed outside of a close proximity to Little Hamilton Island. The sort yard, area for log storage, and most equipment at the sites would be partially screened from view by foreground vegetation and the island itself.

Contractors harvesting timber would continue to support their operations with either a land or floating camp. Visibility of these activities would be a distraction from the natural scenic environment but confined to a relatively small area. Camp operations are required to obtain and follow the necessary state and federal environmental permitting requirements.

Some of the effects of new and temporary road construction borrow pits, and other ground disturbing activities necessary to implement the Central Kupreanof project would be visible from Visual Priority Travel Routes and Use Areas; however these effects would be far less visible than that of timber harvest and would meet the adopted scenic integrity objectives of the Forest Plan. Development of new rock sources, expansion of existing pits for road construction, and the removal of logs within 200 feet on either side of bridge locations for use as stringers would also meet scenic integrity objectives. Pit Development Plans would be approved prior to implementation and mitigation measures for the scenic resource applied if applicable.

Direct and Indirect Effects of Projects Common to All Action Alternatives

The direct or indirect effects resulting from the proposed Projects Common to all Action Alternatives would all meet the Forest Plan Scenic Integrity Objectives. Maintenance of the Cathedral Falls, Goose Lake, Hamilton Creek, and Big John Bay trails, which are identified Travel Routes, would provide for their continued function as intended. Annual maintenance of the Big John Bay cabin, an

identified Use Area, would also provide for the continued function of the cabin as a base for recreational activities. Other identified activities such as pre-commercial thinning, control of invasive plants, vegetative treatment for wildlife, and road maintenance, would have no negative effects upon scenery.

The effects upon Scenery as a result of the Microsale program would meet the Forest Plan scenic integrity objectives of low and very low.

Access Travel Management

Access Travel Management (ATM) would have no effect as no roads proposed for closure are identified visual priority travel routes. The section of Forest Road 6040 from Kake to Seal Point is the only Public Use Road designated as a Visual Priority Travel Route within the project vicinity and will remain open for public use.

Cumulative Effects

Cumulative effects consider the overall scenic effects expected as a result of past, present, and foreseeable future development. These effects include timber harvest, roads, borrow pits, associated construction activities, and existing effects of adjacent non-National Forest lands. Previous development in the project area has modified the scenic environment from a natural condition to a condition where landscapes appear heavily altered. The past development considered with this analysis and listed in the project Catalog of Events contributing the overall scenery cumulative effects for the affected project area viewsheds are the Pipeline Timber Sale EA, Cathedral Timber Sale EA, Hamilton Creek South Timber Sale EA, North Irish Creek Timber Sale EIS, and The Shamrock Timber Sale EIS. effects of past timber harvest would continue to grow to more natural appearing conditions during the period of reasonably foreseeable future and no longer be considered a cumulative effect.

The scale (spacial extent) from which to consider cumulative effects for the scenery resource can be represented as a viewshed, or for the purpose of this analysis the Value Comparison Units which have similar boundaries. Reasonable foreseeable activities such as the small sale program, thinning, and road maintenance would not would not add additional scenic effects to the point of changing the overall scenic integrity as cumulative effects continually change over time (temporal extent) through the regrowth of vegetation. Previously harvested areas visually recover over time and after a period of 30 years are no longer considered to have a cumulative impact.

Percent of Allowable Visual Disturbance represents a measurement of cumulative effects modeled as the expected visual consequences of

timber harvest during the Forest Plan analysis, and is described in Appendix B of the Forest Plan, Final EIS (p. B-23). Visual disturbance outcomes vary by the scenic objectives for each of the land use designations available for timber harvest. Using this model it was assumed for viewsheds within the Timber Production land use designation, that up to 50 percent may be under development at one time. For viewsheds within the Modified Landscape land use designation, up to 25 percent may be under development at one time. This is calculated by adding the past, present, and reasonably foreseeable harvest acres and dividing by the acres of a viewshed or VCU. The following table represents a comparison of the expected cumulative visual disturbance by alternative. As shown, all alternatives are below the total allowable visual disturbance threshold of 50% for Timber Production areas and 25% for Modified Landscape areas specified under the Forest Plan.

Table 3-56. Acres of Past and Proposed Cumulative Visual Disturbance

VCU/Viewshed	Alt 1	Alt 2	Alt 3	Alt 4
4260 (Hamilton)	1,931 (5%)	2,948 (7%)	3,028 (7%)	2,561 (6%)
4271 (Big John Bay)	1,116 (15%)	1,695 (22%)	1,781 (23%)	1,505 (20%)
4290 (Rocky Pass)	943 (2%)	1,533 (3%)	1,567 (3%)	1,151 (2%)
4360 (Upper Castle)	400 (2%)	455 (2%)	859 (4%)	459 (2%)
4380 (Upper Duncan)	225 (1%)	489 (2%)	1,027 (4%)	266 (1%)

* (excludes past harvest greater than 30 years old as visually recovered)

The visual effects of timber harvest are greatest immediately following completion of the project. Within 5 years, vegetation would begin to grow transitioning a change in color from brown to light green. Green tree retention retained in the harvested areas would reduce the overall contrast of new growth with the surrounding forest. From 5 to 20 years after tree removal, young trees become established reaching a height of approximately 15 feet and further reducing the color contrast with adjacent forested areas. After 50 years, the emerging forest would achieve a height of approximately 50 feet. Color contrast at this point is near that of a mature forest and only textural differences are apparent. Edge lines forming the boundary of harvested areas also become less apparent, with the appearance further reduced by

asymmetrical design. At 80 years after a harvest, stand vegetation achieves 75 percent of its mature height. At 100 years, the stand would reach approximately 100 feet in height and appearance of the past harvest would not be evident.

Assuming a continuation of the present harvest levels through successive Forest Plans, removal of all suitable timber within the Central Kupreanof project area is expected to occur within the next 100 to 120 years. During this period, the forest would be in a continuous state of transition towards meeting the desired condition of the Timber Production management prescription objectives. The landscape would be characterized by regenerating harvested areas of mixed age classes from young stands to trees of mature height, typically in 40 to 100 acre groups. The appearance of the activities associated with timber harvest will present a landscape highly modified by this change.

Unroaded Areas

The Forest Roadless Inventory was updated with the 2003 Forest Plan SEIS analysis. Unroaded areas were defined as less than 5,000 acres.

The Central Kupreanof project area includes 366 acres of an unroaded area (2,420 total acres in size), which was not recommended in the 2003 Forest Plan SEIS for wilderness consideration. This area is approximately located in the northwest corner of the project area, and nearly surrounded on all sides by previously harvested units and logging roads. The vegetation is predominantly forest wetland and muskeg. No characteristics or values which would be considered unique are present. The 2008 Forest Plan Land Use Designation encompassing the unroaded area is Timber Production.

In all alternatives no timber harvest, road construction, or rock quarry development is being proposed within the unroaded area. The area would remain unaffected.

Recreation

Resource Analysis Area

The analysis area for recreation includes the project area plus nearby recreation destinations including Cathedral Falls Trail, Hamilton Creek Trail, Goose Lake Trail, Big John Bay Trail and Big John Bay cabin.

Methods

The project area was examined in the field during the summers of 2006 and 2007. Trails were walked and general recreation trends were observed. Recreation use data was obtained from the special use coordinator, trails manager, and cabin manager on the Petersburg Ranger District. Mapping data and acreage numbers were obtained from the GIS coordinators on the District.

Affected Environment

Characterization

The existing road system in the Central Kupreanof area connects to Kake, Alaska, which is a stop on the Alaska Marine Highway. This connection creates relatively easy access to the area for local residents and also visitors from other places in Alaska and out of state visitors. Most recreation in the project area centers around vehicle access, but it also includes some shoreline in Duncan Canal. The Forest Service maintains four trails and one public recreation cabin that are accessible from the Kake road system. Five other cabins in Duncan Canal are located east of the project area but within the vicinity. These are only accessible by boat and plane and cannot be reached from the Kake road system. The road system is used commonly by local Kake residents and visitors. Recreational activities that involve using the road system for access include sightseeing, picnicking, hiking, fishing, and black bear, moose, and deer hunting.

Recreation Opportunity Spectrum in the Central Kupreanof Project Area

To describe, identify, and quantify recreation settings, the Forest Service uses the Recreation Opportunity Spectrum (ROS). The ROS categorizes areas by their activities, remoteness, access, and experiences in a spectrum of classes from Primitive to Urban. The Central Kupreanof Project Area has five of the seven ROS classes: Roaded Modified, Roaded Natural, Semi-primitive Motorized, Semi-primitive Non-motorized, and Primitive (Table 3-57). The two classes not found in the project area are Rural and Urban. See the Glossary for definitions of each ROS class.

Almost half (47%) of the project area is in the Semi-primitive Non-motorized ROS class. These areas are generally at least half a mile from any roads or shorelines and relatively isolated from the sights and

sounds of human activities. Most of the rest of the area is split between Roaded Modified (24%) and Primitive (25%) which are on opposite ends of the development scale in the project area. The Roaded Modified area encompasses the areas immediately surrounding existing units and roads in the area. The Primitive areas are the farthest from roads and units in the area and have little if any evidence of human presence.

Minor components of the ROS within the project area are the Semi-primitive Motorized area and the Roaded Natural area. The Semi-primitive Motorized area (2%) is a narrow strip in the eastern part of the project area along the shoreline of Duncan Canal. This area is away from roads but it is within the sight and sound of boat traffic (and floatplanes landing) in a portion of Duncan Canal. The Roaded Natural ROS class (2%) is located on a six-mile portion of Road 6030 in the northern part of the project area that is very natural appearing since it does not have any timber harvest along it.

Table 3-57. Existing Recreation Opportunity Spectrum (ROS) Classes in the Central Kupreanof Project Area

ROS Class	Acres	Percent
Roaded Modified (RM)	36,984	24%
Roaded Natural (RN)	2,833	2%
Semi-primitive Motorized (SPM)	2,666	2%
Semi-primitive Non-motorized (SPNM)	71,427	47%
Primitive (P)	38,607	25%
TOTAL ACRES	**152,517**	**100%**

Recreation Places and Sites

Recreation Places are specific areas identified by the Forest Plan that are used for recreation activities. They are geographical areas having one or more physical characteristics that are particularly attractive to people for recreation activities. These activities can be dispersed throughout the Recreation Place or concentrated at specific Recreation Sites. A Recreation Site is a specific site and/or facility occurring within a Recreation Place. Recreation Sites generally refer to specific points like anchorages or developed facilities such as recreation cabins and trailheads. Since the majority of the Tongass National Forest is undeveloped, it is primarily used for dispersed recreation activities. Viewing scenery and wildlife, boating, fishing, beachcombing, hiking and hunting are the primary dispersed recreation activities that take place.

In theory, all acres of National Forest have the potential of providing recreation opportunities. However, due to terrain considerations (very steep, inaccessible areas), user preferences, and presence of certain amenities (scenery, good fishing), some areas are more highly valued. These key sites are termed "recreation places." Their selection and identification was done by noting what characteristics or qualities of a site attract and influence visitor use. A knowledge of these key sites aids in the future evaluation of potential effects within the broader ROS concepts. The following discussion describes existing recreation places and sites in the vicinity of the project area.

Trail classes range from Class 1, which is the least developed and most challenging to hike, to Class 5, which is the most developed and easiest to hike.

Hamilton Creek Trail

This recreation access trail is popular with hunters and anglers. The trail is easy (Class 4) with good conditions, dropping 100 feet in elevation along the one-mile length. It is good access to trout, salmon, and char fishing, and waterfowl hunting. Bears frequently fish there during the summer and fall. Picnic tables and fire rings are provided. The trailhead is 13 miles from Kake on Forest Road #6314. The trail leads from the road to Hamilton Creek. To the west lie the tidal flats of Hamilton Bay. The trail continues southeast, meandering upstream along the banks of the creek and leading to many fishing and waterfowl hunting sites. The trail is suitable for bicycles and there was observed bicycle use in 2006. The trailhead is outside the project area but about 1.25 miles from the nearest proposed unit.

Goose Lake Trail

This easy (Class 4) trail is 0.6 miles long and rises 75 feet along its length. The trail is good access for trout fishing, waterfowl hunting, and cross-country skiing. A boat is provided for fishing at Goose

Lake. The trail can be used all year and takes about one hour for roundtrip hike. It is located about 11 miles from Kake on NFS Road 6030. The trailhead is located about 3 miles outside the project area and 3.25 miles from the nearest proposed unit. Goose Lake itself is about 3.5 miles from the project area.

Cathedral Falls Trail

This recreation access trail leads to the spectacular falls on Cathedral Falls Creek. It is only about 0.25 miles and drops sharply 100 feet in that distance. It is moderate difficulty (Class 3) and takes about 30 minutes to hike roundtrip. The trailhead is about nine miles from Kake, eight miles on Road 6314 and one mile on Road 6312. The trail first passes through a small area thick with berries, then descends steeply to the creek. Cathedral Falls is a beautiful spot and popular for fishing. Many local Kake residents enjoy spending time there. No facilities are provided. The trail accesses trout and salmon fishing and photo opportunities at Cathedral Falls. The trail is approximately 2.25 miles from the project area and 2.5 miles from the nearest proposed unit.

Big John Bay Trail

This trail is often used by hunters and leads to Big John Bay and the recreation cabin there. It is 1.75 miles long and takes about two hours to hike roundtrip. It is moderate difficulty (Class 3) and accesses excellent waterfowl, grouse, and black bear hunting. The trailhead is about 16 miles from Kake on NFS Road 6314. It starts in a second-growth stand and then winds its way through old-growth spruce and hemlock forest. The trail ends at the beach on the north end of Big John Bay where the recreation cabin is located. This trail starts in the project area and ends west of the project area. About 0.25 miles are within the project area. The nearest proposed unit is 0.25 miles from the trailhead.

Irish Lakes and Kluane Lake

Irish Lakes and Kluane Lake have no developed recreation facilities but are popular destinations for day use and camping often associated with hunting activities. Kluane Lake is not an official U. S. Geological Survey name but it is sometimes referred to as Kluane by the Forest. It is close to the main road so it is easily accessible without a developed trail. Irish Lakes is farther from the road but adventurous hikers can reach the lake by hiking about a mile cross-country from Road 45806. Actual use data is not available, but it is not believed people hike into the lake very often. More commonly, Irish Lakes is reached by float plane, either private or chartered. One permitted Special Use tent platform sits on the northwest edge of the lake. It is used seasonally for hunting and fishing.

Kake Road System

The Kake road system is used to access recreational activities including sightseeing, picnicking, hiking, fishing, as well as hunting for black bear, moose, and deer. Black bear hunting on the road system in the last 10 years has resulted in harvests from 7 to 37 bears (Pers. Communication, Lowell 2008).

Recreation Opportunities outside the Project Area

Duncan Canal to the east of the project area is a popular recreation area for boaters, fishers, hunters, and campers. Several Forest Service cabins are located here including: Castle Flats Cabin, Castle River Cabin, (Castle River Trail connects the two cabins), Breiland Slough Cabin, Towers Arm Cabin, and Salt Chuck East Cabin.

Towers Arm is about five miles from the nearest proposed unit; the Castle cabins are about six miles away; Salt Chuck East is about 7.5 miles and Breiland Slough is over 10 miles from the nearest unit. Towers Arm is the least used cabin in Duncan Canal because of its limited access due to tides and lack of high quality fishing opportunities.

Rocky Pass to the west of the project area is also popular with boaters, kayakers, fishers, and campers. The one recreation cabin there is Devils Elbow which is about 3 miles from the project boundary and about 9 miles from the nearest proposed unit.

Bohemia Lake (locally known as Jamaica Lake) is located near the end of Road 6030 north of the project area. It has some local day use, as well as camping and hunting opportunities.

Towers Lake, east of the project area, had a Forest Service cabin until recently when it was decommissioned. The site had very low use with few attractions and the cabin was seasonally threatened with flooding from the lake.

Special Use Permits and Outfitter Guides

One Special Use permit exists within the project area at Irish Lakes for a tent platform. It is permitted for personal recreation and hunting activities. Other intermittent hunting camps are found in the area but they are not permitted for year round storage of gear or materials. No permits have been issued for outfitter and guide activities within the project area.

Big John Bay and Big John Bay Creek, just outside the project area, are popular areas for black bear outfitter/guide activities. In 2004, four black bear guides took hunters to Big John Bay and Big John Bay Creek. In 2007 and 2008, four guides operated in those areas.

Environmental Consequences

Effect to Recreation Opportunity Spectrum (ROS)

All of the action alternatives would modify the Recreation Opportunity Spectrum to some degree. In all three action alternatives, some areas in the Semi-primitive non-motorized setting would change to Roaded Modified with the proposed units and roads. In Alternatives 2 and 4, the effects would be minimal and the change in acres from a semi-primitive setting to a roaded setting would be less than one percent of the project area.

Alternative 3 proposes some harvest units and roads in a currently primitive setting, so there would be decreases in both semi-primitive and primitive areas as well as expanded areas of roaded settings. The increase in the Roaded Modified setting would be 5.4% of the project area. The semi-primitive and primitive areas would decrease by 1.1% and 4.3% respectively. See Tables 3-58 and 3-59 below for changes in acres and percentages for each alternative. See Appendix A, in the Recreation Resource report, located in the project record, for maps showing where the changes would occur to ROS for each alternative.

Table 3-58. Recreation Opportunity Spectrum (ROS) Class Acres in the Project Area

ROS Class	Alt. 1 Acres	Alt. 2 Acres	Alt. 3 Acres	Alt. 4 Acres
Roaded Modified (RM)	36,984	38,409 (+1,425)	45,347 (+8363)	37,088 (+104)
Roaded Natural (RN)	2,833	2,833	2,833	2,833
Semi-primitive Motorized (SPM)	2,666	2,666	2,666	2,666
Semi-primitive Non-motorized (SPNM)	71,427	70,002 (-1,425)	69,617 (-1,810)	71,323 (-104)
Primitive (P)	38,607	38,607	32,054 (-6,553)	38,607
TOTAL ACRES	**152,517**	**152,517**	**152,517**	**152,517**

Table 3-59. Recreation Opportunity Spectrum (ROS) Percentages in the Project Area

ROS Class	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Roaded Modified (RM)	24.3%	25.2%	29.7%	24.3%
Roaded Natural (N)	1.9%	1.9%	1.9%	1.9%
Semi-primitive Motorized (SPM)	1.7%	1.7%	1.7%	1.7%
Semi-primitive Non-motorized (SPNM)	46.8%	45.9%	45.7%	46.8%
Primitive (P)	25.3%	25.3%	21.0%	25.3%
TOTAL PERCENTAGES	**100%**	**100%**	**100%**	**100%**

Effects to Recreation Places and Sites within the Project Area

Big John Bay Trail and Cabin

The Big John Bay trailhead and approximately ¼ mile of the trail are within the Central Kupreanof project area. Alternatives 2, 3, and 4 all propose harvest within a half-mile of the trailhead on Road 45001. Unit 313 would be about 0.25 miles from the trailhead and Units 310, 312, and 314 are about 0.5 miles away from the trailhead. Trail users and cabin users that access the cabin by the trail would be affected by the sights and sounds of logging from these units for several weeks to a couple months.

Irish Lakes

Alternatives 3 and 4 propose to harvest Unit 271 (22 acres) which is approximately 1.5 miles northeast of Irish Lakes. During the actual

logging of Unit 271, the sound of machinery may be heard at Irish Lakes and at the permitted tent platform located on the northwest side of the lake. This would be a short-term effect lasting approximately 2-3 weeks.

Kluane Lake

Alternatives 2, 3, and 4 all propose units within a mile of the lake. Alternative 4 would have the least effect with only two units proposed near the lake; a 10-acre unit a half mile away (Unit 253) and a 41-acre unit one mile away (Unit 250). Alternative 2 would have a moderate effect with four units within one mile. Alternative 3 would have the most effect on recreation at the lake with seven units proposed within a mile and a new road proposed north of the lake. The sounds of logging and road building would be most apparent in Alternative 3, with nearly 300 acres of timber harvest proposed within one mile of the lake. Alternative 2 proposes about 220 acres within one mile of the lake and Alternative 4 proposes about 50 acres within one mile of the lake.

Kake Road System

During timber harvest and road construction activities in Alternatives 2, 3, and 4, recreational activities that use the road system may be temporarily displaced to areas where no harvest activities are taking place.

Effects to Recreation Opportunities outside the Project Area

Trails/Cabins

The three trails outside the project area (Cathedral Falls, Goose Lake, and Hamilton River) would not be directly affected by any of the alternatives, but hikers would notice an increase in traffic, especially log trucks, as they traveled the roads to the trailheads. This would be a short-term effect that would end when logging was complete. The increased log truck traffic would also affect access to the Big John Bay trail which is partially inside the project area.

Visitors at Big John Bay Cabin would not be directly affected by the proposed timber harvest, especially if they accessed the cabin by water and did not use the trail. At the cabin, they may occasionally hear some distant sounds of logging. If the cabin users did hike the trail then the above effects to the trail could affect them.

Outfitter/Guides

No outfitter/guides currently operate within the project area. The black bear hunting guides that operate out of Big John Bay and Big John Bay Creek would not be directly affected by any of the proposed harvest activities because they primarily operate from the water and shoreline. The distant sound of logging equipment or trucks may be apparent occasionally, but it would not noticeably change the recreation experience in Big John Bay and Creek.

Effects by Alternative

For all alternatives, some Recreation Opportunity Spectrum (ROS) classes would not change. The Semi-primitive Motorized setting along the shoreline of Duncan Canal and the Roaded Natural setting along Road 6030 in the northern part of the project area would remain the same in all alternatives, including the No Action Alternative.

Alternative 1

Alternative 1 (No Action) proposes no new timber harvest or road building in the project area. The recreation in the area would remain as it is with no changes to existing Recreation Opportunity Classes (ROS). The settings at the existing Recreation Places at Irish Lakes and Kluane Lake would remain unchanged as well as the trails and cabin in the area. Roaded access in the area would not change from the current condition.

Alternative 2

Alternative 2 would have little effect to recreation. Most proposed units are within the Roaded Modified setting so the ROS class would not change. A few units are located just outside the roaded setting, however, causing about 1% of the area to change from a semi-primitive setting to a roaded setting. This alternative would not harvest any units near Irish Lake, but would harvest four units within a mile of Kluane Lake. This would detract from the recreation experience during the few months the logging was taking place. There would be 7.3 miles of new NFS road constructed, 2.9 miles of reconstructed road, and 3.9 miles of temporary road construction in this alternative. This would result in a moderate increase in roaded access in the area. However, the increase in motorized access would be temporary. All temporary roads would be decommissioned after timber harvest and all new and reconstructed NFS roads would be closed within ten years of timber harvest activities. An additional 1.1 miles of existing NFS road would also be closed at this time.

Alternative 3

Alternative 3 proposes the most timber harvest and road building and would have the most effect to recreation. Some proposed units are within existing semi-primitive and primitive recreation settings, so the roaded setting would increase by about 5.5% and the semi-primitive and primitive settings would decrease by that amount. Recreationists at Kluane Lake would be affected by the nearby sights and sounds of timber harvest and road building for several months. Unit 254 (14 acres) is a few hundred feet from the lake and would be the closest unit to the lake. Timber harvest of that unit would be very apparent to recreationists at the lake. Four other units within a mile of the lake would add to the sights and sounds of logging. One timber harvest unit (Unit 271) is also proposed about 1.5 miles from Irish Lakes. The sound of logging would most likely be heard at the lake during harvest of that unit also.

The overall experience in the project area would still include a lot of semi-primitive and primitive opportunities as well as a slightly expanded roaded setting.

There would be 25.1 miles of new NFS road constructed, 9.1 miles of reconstructed road and 6.1 miles of temporary road constructed. This alternative proposed the greatest increase in roaded access in the area. However, the increase in motorized access would be temporary. All temporary roads would be decommissioned after timber harvest and all new and reconstructed NFS roads would be closed within ten years of timber harvest activities. An additional 2.0 miles of existing NFS road would also be closed at this time.

Alternative 4

Alternative 4 would have the least effect to recreation of the three action alternatives.

The recreation settings in the project area would remain essentially the same (less than 1/10 of 1% change) with only 104 acres changing from a semi-primitive setting to a roaded setting. Irish Lakes would not be affected by nearby timber harvest and Kluane Lake would only be minimally affected by two small nearby units. Recreationists at the lake would be aware of nearby activities for only a few weeks.

This alternative proposes no new NFS road construction, 2.6 miles of road reconstruction and 2.2 miles of temporary road construction. This would result in the least increase in roaded access in the area. However, the increase in motorized access would be temporary. All temporary roads would be decommissioned after timber harvest and all new and reconstructed NFS roads would be closed within ten years of timber harvest activities. An additional 2.0 miles of existing NFS road would also be closed at this time.

Cumulative Effects

The Catalog of Past Events for Kupreanof Island was referenced in determining cumulative effects. The area analyzed for cumulative effects includes the project area plus the nearby recreation destinations of the four trails and one cabin.

Recreation settings in Central Kupreanof Island have changed since timber harvest activities began in the late 1960's (Kupreanof Catalog of Past Activities). The area now has numerous roads and timber in various age classes. Many of the original primitive and semi-primitive recreation settings have changed to more developed settings. People expect to see timber harvest in the area now. New harvest would add to the developed feel of the area, but would not be a big change from its current condition. The proposed activities for this project would not significantly change the existing recreation opportunities.

Past projects that have enhanced recreation in the central Kupreanof vicinity include four trails: Goose Lake, Cathedral Falls, Hamilton River, and Big John Bay. The cabin at Big John Bay, although outside the project area, has enhanced recreation in the area because the trailhead to the cabin is within the project area on the road system to Kake. Cabin users sometimes use the road system and trail to access the cabin. Probably more often cabin users arrive at the Big John Bay cabin by boat or floatplane, especially out-of-town visitors. The construction of logging roads near Kluane Lake has increased recreation use at the lake because of the close access.

The upcoming road project to reconstruct and improve the Kake to Seal Point road is outside the project area, but will enhance recreation on the whole road system by improving that section of road which is currently in very poor condition. The road improvements include paving the road and replacing two bridges on the seven-mile section of road. The Kake to Seal Point road is used to access all of the trails in the area and also the Big John Bay cabin.

The Petersburg Ranger District is currently reanalyzing recreation carrying capacity and outfitter/guide allocations across the district. No significant changes are anticipated; however any effects will be analyzed in the Petersburg Outfitter Guide EA.

The 6367 Small Timber Sale project planned for 2008 is just outside the project area on Road 6367. It would not noticeably add to the cumulative effects for recreation because it is on an existing road within a roaded modified recreation setting.

The ongoing Access Travel Management process which is analyzing which roads to keep open, which roads to close, and which roads to allow Off-road Vehicle (ORV) use on, could have some effects on recreation in the project area. The current recommendations for the Central Kupreanof project area would have minimal effect on recreation because the 10 miles of road recommended for closure have little or no recreation use. These roads would be closed to vehicle traffic but would still allow foot traffic. Road management objective recommendations will be analyzed in the District's ATM process.

Environmental Consequences for Projects Common to All Action Alternatives

Trail Maintenance

The direct effect from the proposed trail maintenance projects would be to maintain and improve the recreation experience on the four trails in the area. It would also help maintain the safety of the trails for the public. Indirect effects could include an increase in traffic on the roads with well-maintained trails.

Cabin Maintenance	The effect of maintaining the Big John Bay cabin would also be to improve the recreation experience and safety of the cabin users.
Invasive Plant Control	There would be no effects to recreation from the proposed invasive plant control project.
Fisheries/ Hydrology	There would be little effect to recreation from the proposed fisheries/hydrology project of pulling culverts on fish streams on closed roads. Walking the roads after the culverts were pulled would be somewhat more difficult, but still a likely activity.
Silviculture/ Wildlife	There would be no effects to recreation from the proposed silviculture/wildlife project of pre-commercial thinning second-growth stands.
Transportation	The proposed transportation project of maintaining the Kake area roads would enhance the recreation experience in the area and increase the safety of all drivers.
Microsales	There would be no significant effects to recreation from the proposed Microsales program.

Heritage Resources

Heritage resources include an array of historic and prehistoric archaeological sites and traditional cultural properties. The National Historic Preservation Act (NHPA) sets forth Government policy and procedures regarding these "historic properties" -- that is, districts, sites, buildings, structures and objects included in or eligible for the National Register of Historic Places. Section 106 of the NHPA requires that Federal agencies consider the effects of their actions on such properties, following regulations issued by the Advisory Council on Historic Preservation (36 CFR 800).

The Section 106 review process seeks to consider historic preservation concerns with the needs of federal actions. Review occurs through consultation with Alaska State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation (ACHP), Indian Tribes, and other parties with an interest in the effects of the undertaking on historic properties. One of the goals of consultation is to identify historic properties that potentially may be affected by the undertaking, assess potential effects and seek ways to avoid, minimize, or mitigate any adverse effects on historic properties. Forest Service archaeologists consulted with the Organized Village of Kake (OVK) and the Wrangell Cooperative Association (WCA), the tribal groups that are culturally affiliated with the project area. As part of our open working relationship with tribal groups regarding the protection of heritage resources, we met with OVK about the planned project and supplied both tribes with a copy of our Heritage Resource Report for comment (Esposito 2006).

Forest Service archaeologists also conducted a heritage resource investigation of the Central Kupreanof project area to ensure that the procedural requirements of 36 CFR 800 were met. In accordance with the 2002 Programmatic Agreement among the Forest Service Alaska Region, the ACHP, and the SHPO, resource reports were submitted under modified 36 CFR 800 regulations implementing Section 106 of the National Historic Preservation Act. Heritage resource surveys did not result in the identification of any new sites and no known historic properties would be affected by project activities.

Area of Potential Effects

The Area of Potential Effect (APE) is the geographic area within which the effects of timber harvest and road construction may cause changes in the character or use of historic properties, if such properties exist. The APE was defined using the Central Kupreanof Timber Harvest’s project area boundary.

Existing Condition

According to oral tradition and various ethnographic accounts, the Tlingit are the dominant native group of southeast Alaska. A majority of the Central Kupreanof project area lays within the traditional territory of the Kake Tlingit, who occupied the north half of Kuiu Island, the western portion of Kupreanof Island, with sporadic occupation along the mainland shore of Frederick Sound as well as parts of Baranof Island and Prince of Wales Island. The east side of the project area also lies within the traditional territory of the Stikine Tlingit, who occupied the mainland coast from Cape Fanshaw to the midpoint of Cleveland Peninsula, as well as the eastern portion of Kupreanof Island, the east coast of Prince of Wales Island from Red Bay to Thorne Bay, and all of Mitkof, Etolin, and Zarembo Islands. Prehistoric site types in the region include villages, seasonal camps, stone and wood stake fish weirs, as well as pictographs and petroglyphs.

Kupreanof 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. Prehistoric site types on the island include camps, villages, forts, petroglyphs, as well as fish traps and weirs. Historic period sites include cabins, mining claims, fur farms, gardens, canneries, salteries, a driftwood canoe, and culturally modified trees (CMTs). Records show that there are no sites within the Central Kupreanof Project Area.

Analysis and Survey Methods

Prior to field investigation, various historical records and ethnographic accounts were examined to determine previous cultural use in the project area and its vicinity. We also researched prior heritage resource surveys, Petersburg/Wrangell Area heritage files and atlases, the Alaska Heritage Resource Survey (AHRS) listings, GIS archaeological site covers, and the Tongass Site database. OVK was consulted and queried about known or suspected sites in the area.

There have been 75 heritage resource surveys on Kupreanof Island since 1974, five of which were conducted within the Central Kupreanof project area. These surveys were conducted between 1974 and 2000, and include several investigations of proposed timber sales as well as a survey for a small mineral exploration project.

In addition to the background research, archaeologists conducted a pedestrian survey of 251 acres of various types of terrain in search of undiscovered sites and other heritage resources. Proposed timber harvest units, proposed road locations were surveyed while paying special attention to fish streams, lake edges, and stands of Alaska

yellow cedar, resources that were 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 2002 Programmatic Agreement.

Direct and Indirect Effects by Alternative

Heritage resource surveys did not result in the identification of any new sites and no known historic properties will be affected by project activities (Esposito 2006). None of the proposed action alternatives will have a direct or indirect effect upon known heritage resources within the APE. All of the planned timber harvest units and proposed roads are inland and on relatively steep terrain, making them within the low sensitivity zone for cultural resources. The existing log transfer facility (LTF) at Little Hamilton Bay will be used, and its use will not affect any known archaeological sites.

Cumulative Effects

Cumulative impacts to heritage resources on the Tongass may result from natural erosion, weathering, sedimentation and wind events as well as cultural processes such as public use, commercial development, timber harvest, and road construction. Logging and road access for hunting, subsistence use, and recreation are the primary activities that have occurred within the Central Kupreanof project area. The project area lies just 10 miles southeast of the city of Kake and is easily accessible to Kake residents and visitors via an extensive road system. As most of the recorded archaeological sites on the island are concentrated near the marine shore, outside of the project area boundary, the activities associated with the Central Kupreanof project will not have any cumulative effects to heritage resources. Timber harvest and increased road access would take place inland and on steep terrain. Heritage resource surveys for the project revealed there are no sites within the project area, and that site probability in this area is low.

Additional foreseeable activities within the project area include Projects Common to all Action Alternatives, timber salvage Microsales, and the Kake roads analysis process (RAP). The Projects Common to all Action Alternatives are proposed to occur within previously disturbed areas, such as along the existing road and trail system or in harvested timber units, and will not affect heritage resources.

Microsales are not expected to cause effects to heritage resources as they would target dead and/or downed trees adjacent to the existing road system. In accordance with 36 CFR 800.13(a) and (b)(1), should

any surface or subsurface heritage resources be encountered during land use activities, such activities shall cease immediately and the District Ranger shall be notified. If such properties are determined potentially eligible for the National Register of Historic Places and the project is determined to have adverse effects on the property, the Petersburg Ranger District archaeologist will address project effects and comply with Section 106 procedures before the project may proceed.

The current RAP recommendations would have minimal effect on heritage resources, as there are no known sites within the project area. Future recommendations for road storage, decommissioning, closure and maintenance schedules will be analyzed in the District's ATM EA.

Intensive heritage resource surveys and site monitoring have been implemented since the 1980s. 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.

The Tongass Land Management Plan addresses the desired condition of heritage resources through a monitoring and evaluation plan. As specified in the Programmatic Agreement (2002), we monitor selected areas of direct impact during and/or after the actual ground disturbance. If inadvertent discoveries are made during project implementation, the Forest Service shall fulfill its consultation requirements in accordance with 36 CFR 800.13. Mitigation measures would be agreed upon and implemented before project activities may proceed.